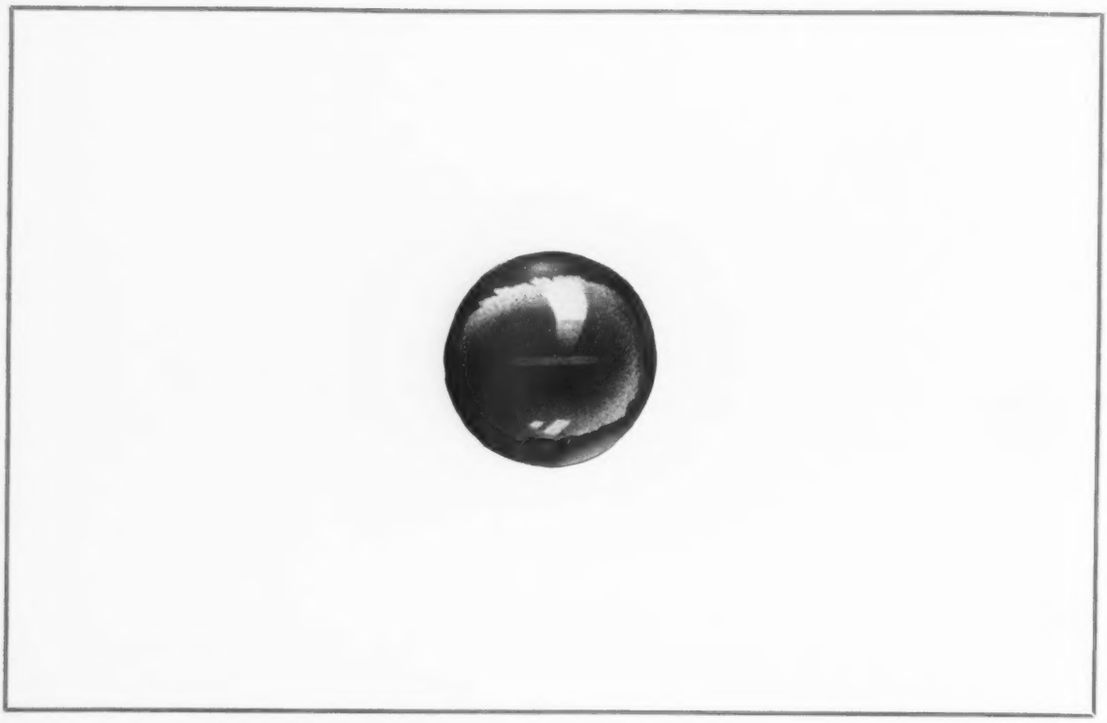
CERAMIC ABSTRACTS and THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

FEBRUARY 15, 1944

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES



So we matched the colors of a glass eye . . .

A taxidermy supply house could no longer obtain glass eyes from foreign sources, so it was decided to manufacture them. We were asked to match the colors used in their production. As a result, another company was added to the long list of Drakenfeld customers.

Aside from providing the glass and ceramic manufacturers with standard colors and coloring chemicals for a great many years, our most interesting contribution has been that of matching colors for customers. In our case history files are objects ranging from a deep blue telegraph call box to a cream-and-coffee colored section of a cigarette carton—all representing colors we have matched. No matter in what form the request arrives, our technologists go to work with a will, match the color, and in many cases suggest ideas that result in better products and help cut production costs.

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THE SCIENTIFIC COUNTER CURRENT RAPID BATCH MIXING SHUTTLE

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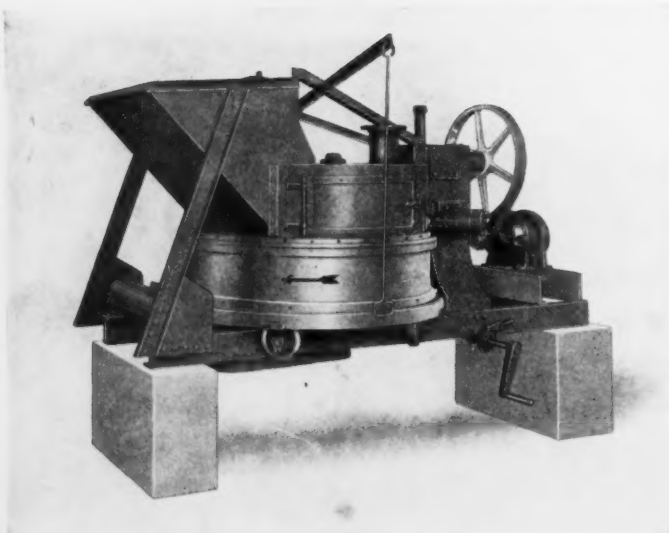

(Upper left)
Illustration shows how material is conveyed by clockwise rotation of mixing pan and deflected by stationary side wall plow into the path of counter-clockwise rotating plows and muller which are established off-center of pan diameter.

(Lower left)
"Lancaster" Mixer, Symbol EMG. Closed pan type, fitted with full batch stationary hopper.

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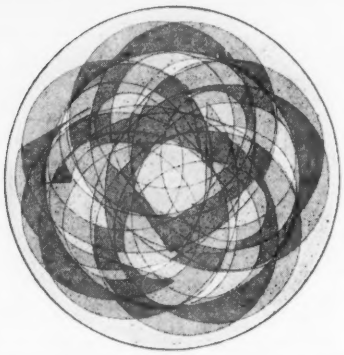
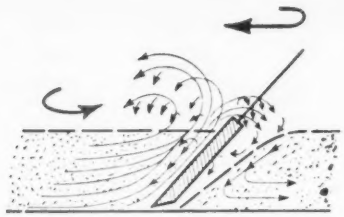


These curves clearly illustrate the paths covered by mixing tools during one revolution of the pan.



The stationary bottom plow is shown turning material around its horizontal axis, in waves, bringing bottom layers to the top.

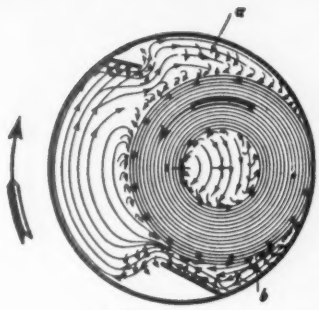


Diagram "A"

Material conveyed by the pan in clockwise direction at moderate velocity is diverted by a stationary side scraper plow into the narrow trough at "a." It is picked up by the counter-clockwise rotating mixing tool equipment, set off-center of the mixing pan. Material leaving the whirlpool at "b" is picked up by the stationary bottom plow. Countless crossing-over points are created by this ever-changing activity . . . turning, dividing and dispersing the entire batch with each revolution of the pan.

(Extreme left) The central discharge valve fully opened. Note the absence of any working parts in the path of the discharging batch. (Left) The central discharge valve in closed position. This valve is approximately one-third the diameter of the pan.

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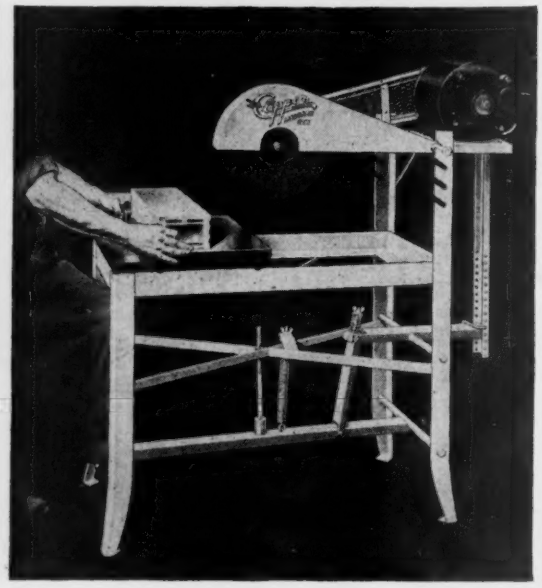

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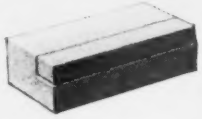
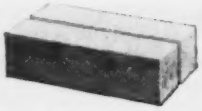
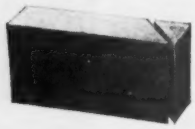




Silica brick cut lengthwise for open hearth furnace work, only 9 seconds were required to complete this cut!

Basic refractories for steel furnaces or cement kilns must be accurately installed. This magnesite brick was cut in 12 seconds.



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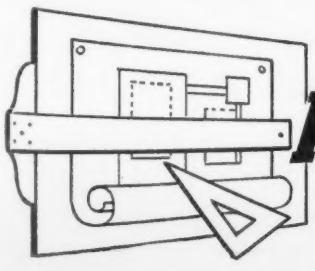

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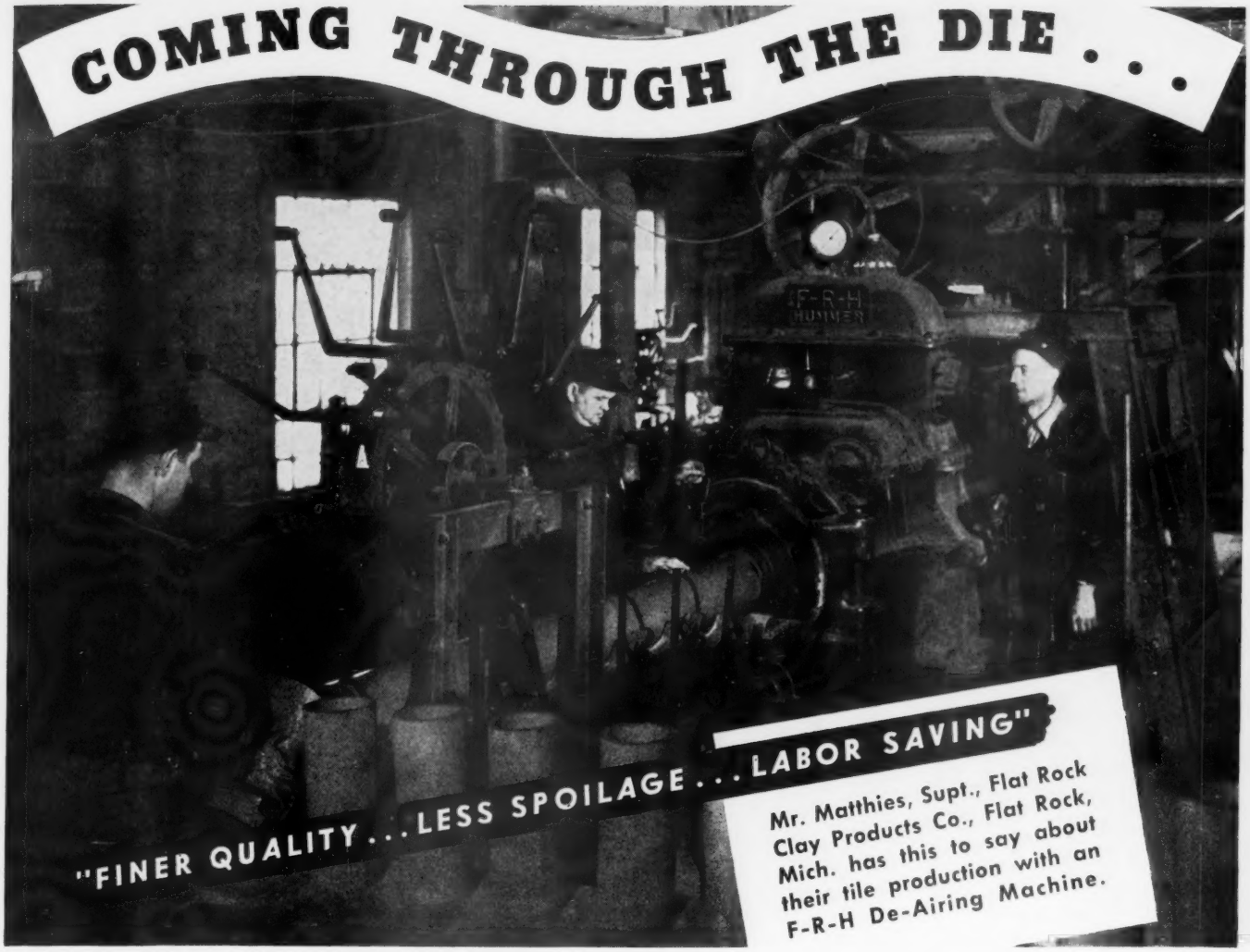
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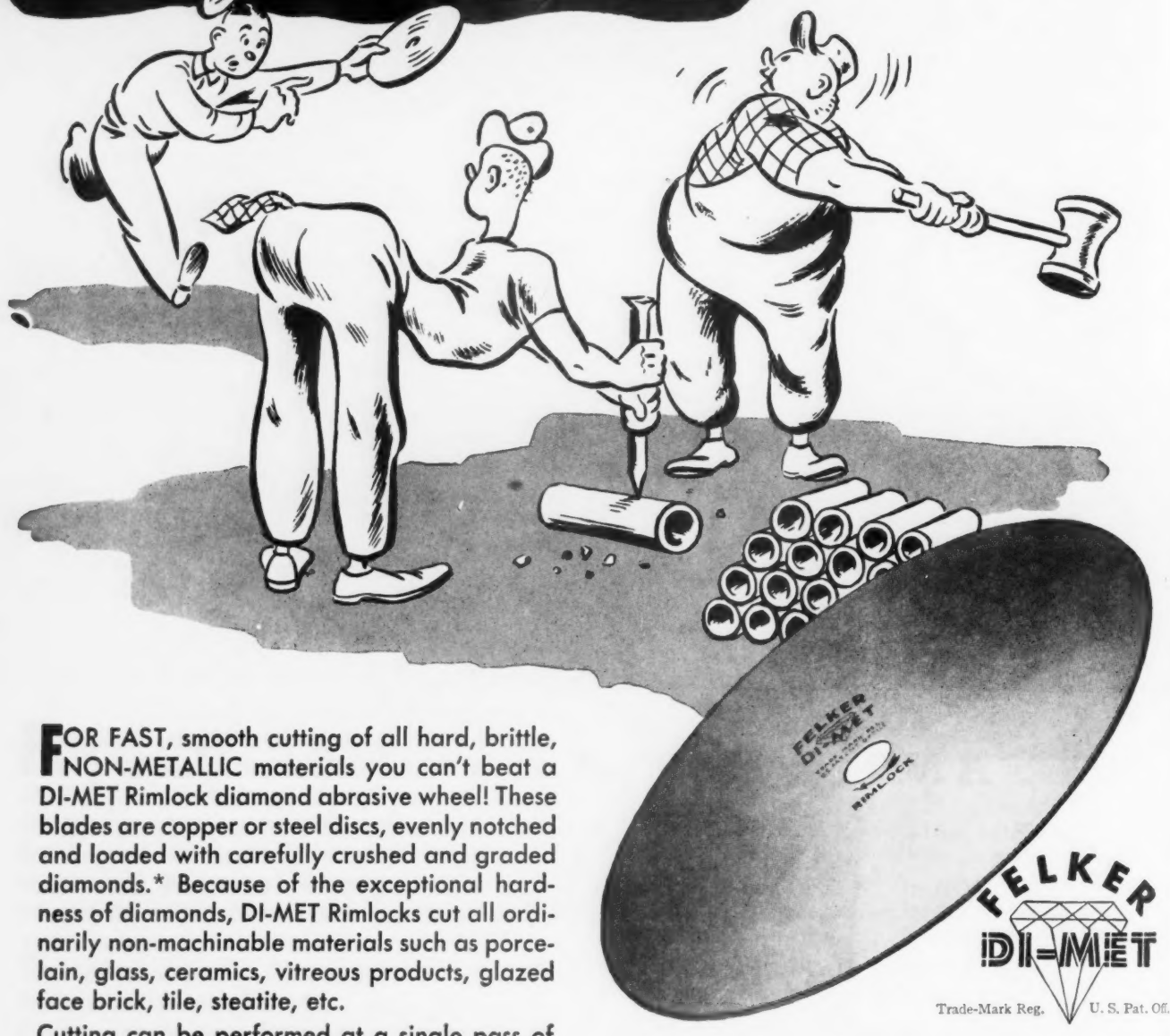

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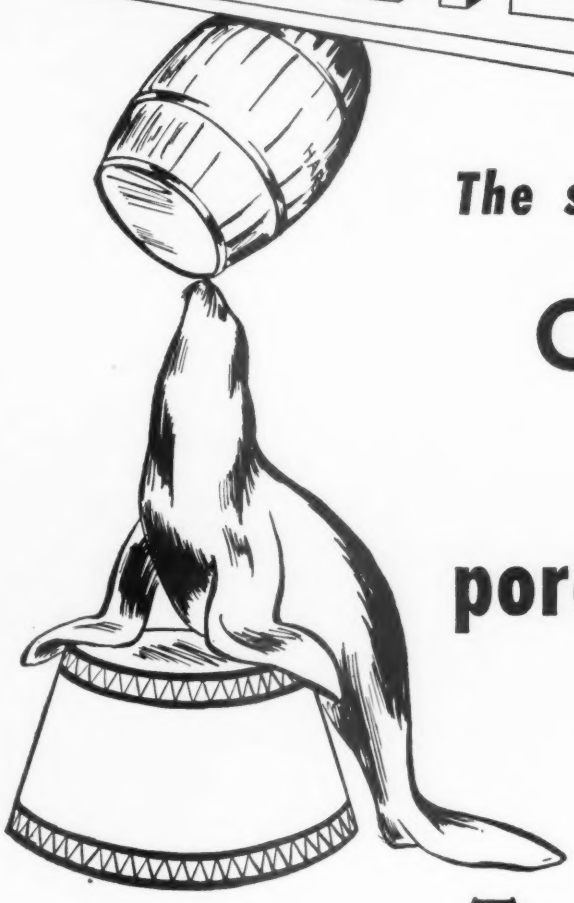

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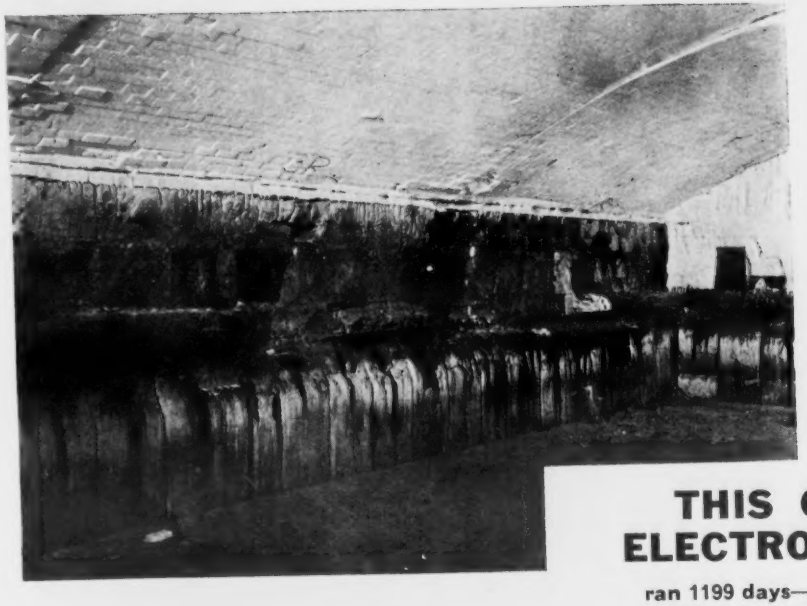

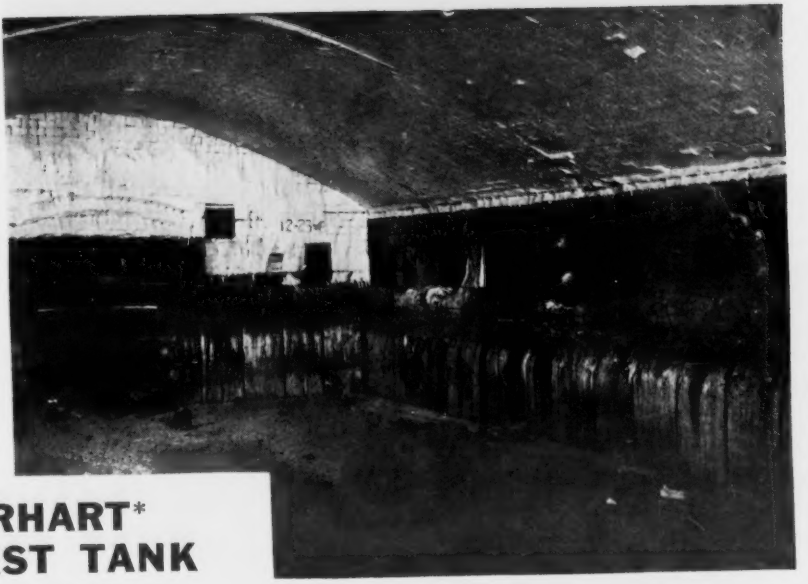

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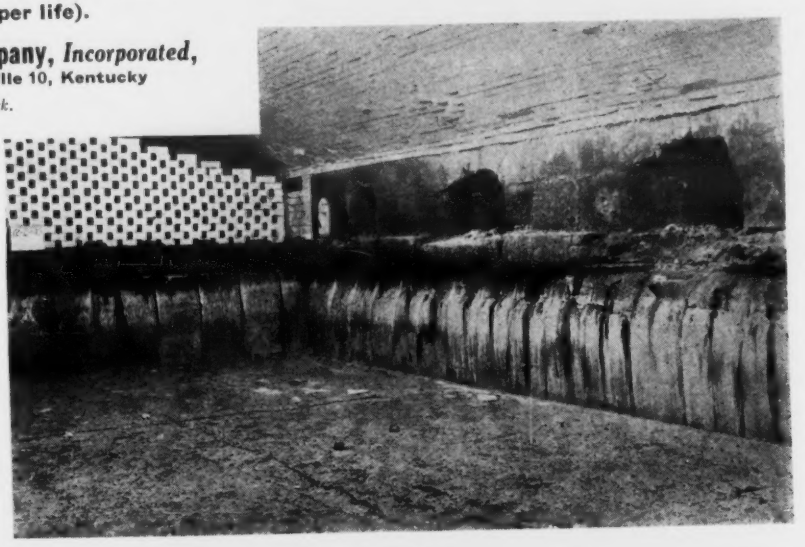

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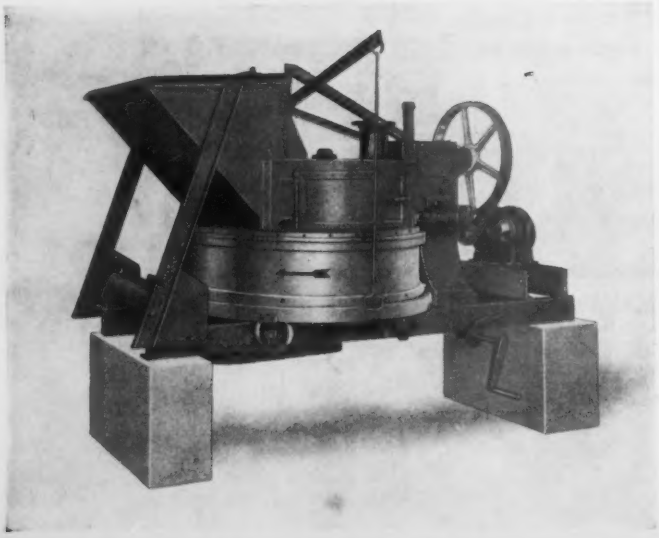

(Upper left)
Illustration shows how material is conveyed by clockwise rotation of mixing pan and deflected by stationary side wall plow into the path of counter-clockwise rotating plows and muller which are established off-center of pan diameter.

(Lower left)
"Lancaster" Mixer, Symbol EMG. Closed pan type, fitted with full batch stationary hopper.

Ceramic Abstracts Section

Compiled by

THE AMERICAN CERAMIC SOCIETY

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Vol. 23 **February 15, 1944** **No. 2**

Abrasives

Double-end chisel-grinding machine. ANON. *Machinery* [N. Y.], **50** [4] 204 (1943).—The Standard Electrical Tool Co., Cincinnati, Ohio, has brought out a heavy-duty double-end grinder for grinding chisels uniformly on a production basis. With a patented chisel-grinder attachment, it is capable of grinding 1000 chisels per day. R.H.B.

Faster tool grinding with cup wheels. ROGER D. PROSSER. *Machinery* [N. Y.], **50** [4] 198 (1943).—Grinding on the face of a cup wheel gives a flat clearance, not undercut as is the case when tools are ground on the periphery of a straight wheel. By slightly crowning the face of the cup wheel, a line contact between the wheel and the work is obtained. An arrangement for producing the slight radius or crown on the face of the wheel is shown. This new method of grinding results in much cooler and more rapid grinding of carbide, Stellite, high-speed steel, and other modern cutting tools. R.H.B.

Manufacture of diamond-impregnated tools. ANON. *Machinery* [London], **57** [1480] 561–64 (1941).—Diamond-impregnated wheels produce sharp, clean cutting edges on cemented carbide tipped tools with short grinding times and with the minimum removal of stock. In addition to wheels, hand lap and diamond-impregnated drills, saws, and disks are produced by the Neven process of bonding with metallic powders and chemicals and fusing after compression in molds. V.R.E.

"Oiliness" and surface roughness. J. J. BIKERMAN. *Jour. Soc. Chem. Ind.* [London], **62** [3] 41–42 (1943).—When a circular plate of radius a moves to or from another plate in a liquid the viscosity of which is η, the time, t, required to change the clearance between the plates from h_1 to h_2 is $t = \pm\frac{3\eta a^2}{4F}\left(\frac{1}{h_1^2} - \frac{1}{h_2^2}\right)$. If the plates are initially in contact, h_2 is a measure of the heights of a few protuberances upon which a smooth plate rests; h_1, the height to which the plate is raised, may be neglected. From F, the small tension required to lift the plate, and the other parameters, h_2 may be calculated. Other methods use the air leakage beneath a cup lightly pressed on the surface (Solex micrometer) and the capacity (electric) of the two metallic surfaces in contact. L.R.B.

Securing fine surfaces by grinding: VII. H. J. WILLS AND H. J. INGRAM. *Machinery* [N. Y.], **50** [4] 181–85 (1943).—Special consideration is given to the correct procedure of truing grinding wheels. Either a diamond or an abrasive wheel can be used for both dressing and truing the face of a grinding wheel to be used in fine grinding. If a grinding wheel is used without a coolant, it should be trued without a coolant and vice versa. To prevent scratches caused by particles of abrasive that have been crushed into the wheel face, usually by a diamond that is too dull, the wheel face should be scrubbed, after truing, with a stiff brush and plenty of water. Wheels should be trued at specific intervals. The truing should be done at the rotative and traversing speeds at which the wheel operates when grinding. Only sharp diamonds should be used in truing; otherwise the desired cutting effect will not be achieved and faulty surfaces will result. While it is usually necessary to dress the sides of a straight wheel when the sides are used for grinding, as when grinding to a shoulder on a crankshaft, it is undesirable to remove material from the sides of a wheel solely for truing, as this rapidly reduces the thickness of the wheel. In truing thin-edged wheels, the best practice is to start the truing cut at the weakest part, which is usually the extreme edge of the periphery, and then continue truing toward the arbor. For Parts **IV** to **VI** see *Ceram. Abs.*, **23** [1] 2 (1944). R.H.B.

SEPARATE PUBLICATION

Diamond Deposits of the Gold Coast. N. R. JUNNER. *Gold Coast Geol. Survey Bull.*, No. 12, 52 pp. (1943). London. Price 3s.—Gold Coast diamonds, because of their small size and quality, are used principally as abrasives for industrial purposes. The deposits were discovered almost accidentally in 1914, and production to date is over 15 million carats worth over £8,000,000. The output comes chiefly from the Birim European-worked field of 380 square miles, located 60 to 80 miles northwest of Accra, and the smaller Bonsa native-worked field. The diamonds occur in Pliocene to Recent gravels in the beds and flats of rivers, and in no instance has a kimberlite pipe similar to the host rock of South African diamonds been discovered. V.R.E.

PATENTS

Abrasive article. R. C. BENNER AND R. L. MELTON (Carborundum Co.). Can. 416,137, Nov. 2, 1943 (Jan. 21, 1942). G.M.H.

Abrasive article and manufacture. A. L. BALL, R. C. BENNER, AND R. L. MELTON (Carborundum Co.). U. S. 2,335,902, Dec. 7, 1943 (Nov. 24, 1941).—A series of convolutions of thin felted strip of fibrous textile material having substantially all the abrasive particles and a suitable adhesive binder included internally and throughout the fibrous strip material of which the abrasive article is formed.

Abrasive article and method of making. H. W. BUELL (Carborundum Co.). U. S. 2,337,445, Dec. 21, 1943 (Dec. 16, 1941).

Abrasive tools. E. D. TEAGUE AND NORTON GRINDING WHEEL CO., LTD. Brit. 557,194, Nov. 24, 1943 (June 25, 1942).

Abrasive wheel. B. H. WORK AND D. S. KLAUDER, JR. (Carborundum Co.). Can. 416,139, Nov. 2, 1943 (Feb. 27, 1942; in U. S. March 1, 1941). G.M.H.

Combined abrasive pulpifier and washing apparatus. E. T. MCGREGOR. U. S. 2,338,383, Jan. 4, 1944 (Feb. 13, 1941).

Cutting tool having tip or insert of tungsten carbide. J. C. GASCOIGNE. U. S. 2,337,322, Dec. 21, 1943 (April 24, 1941).

Feeding mechanism for grinding machines. W. F. FRASER. U. S. 2,338,631, Jan. 4, 1944 (Aug. 29, 1940).

Grinding machine. A. E. MANDEVILLE AND L. J. LALIME (Brown & Sharpe Mfg. Co.). U. S. 2,336,796, Dec. 14, 1943 (Aug. 28, 1942). C. L. OTT. U. S. 2,336,955, Dec. 14, 1943 (Sept. 19, 1941). E. A. HALL AND R. S. BEVERLIN (Hall Mfg. Co.). U. S. 2,338,509, Jan. 4, 1944 (Jan. 19, 1943).

Grinding tool. R. S. BEVERLIN (Hall Mfg. Co.). U. S. 2,338,484, Jan. 4, 1944 (Jan. 12, 1943).

Grinding wheel. LORING COES, JR. (Norton Co.). Can. 416,317, Nov. 9, 1943 (Sept. 22, 1942; in U. S. Nov. 1, 1941, and June 4, 1942). G.M.H.

Grinding wheel truing apparatus. L. A. KASPARSON (Norton Co.). U. S. 2,336,018, Dec. 7, 1943 (July 11, 1941). E. V. STATIA, SR. (one-half to E. L. Chapman). U. S. 2,336,758, Dec. 14, 1943 (Sept. 26, 1942).

Hardness-testing machine. L. P. PODESTA. U. S. 2,338,537, Jan. 4, 1944 (Feb. 26, 1940).—A machine for testing the hardness of grinding wheels.

Honing device. W. P. CANNING (American Optical Co.). U. S. 2,337,183, Dec. 21, 1943 (Nov. 3, 1941).—A honing device for a rotatably mounted abrading wheel.

Manufacture of abrasive articles. R. C. BENNER AND R. L. MELTON (Carborundum Co.). Can. 416,138, Nov. 2, 1943 (Jan. 21, 1942). G.M.H.

Plate-polishing machine. LOUIS ILLMER AND V. R. PALLAS (Pallas assignor to Leota T. Pallas). U. S. 2,338,644, Jan. 4, 1944 (Dec. 30, 1940).

Wheel-dressing device. OTTO STORZ (McGill Mfg. Co.). U. S. 2,336,650, Dec. 14, 1943 (Jan. 16, 1941).

Art and Archeology

Early ceramic arts as a reflection of Chinese esthetic ideals. WALTER READ HOVEY. *Bull. Amer. Ceram. Soc.*, **23** [1] 34–38 (1944).—8 figures.

Garden of Gods Pottery produces unique ware according to specifications only. ANON. *Ceram. Ind.*, **41** [1] 44 (1943). H.T.

Glasshouse friggers: VI, Bugles and bells. T. TAYLOR SEAGO. *Pottery Gaz.*, **68** [787] 34 (1943). **VII, Jacob's ladder and flip-flop.** *Ibid.*, [789] 170. **VIII, Cauldron and tripod.** *Ibid.*, [790] 222.—The method of making this type of frigger is briefly described. **IX and X, Millefiori.** *Ibid.*, [793] 389; [794] 447.—This ware consists of transparent or opaque glass covered with a multitude of tiny flower forms or geometric patterns in a great variety of color, the forms being transverse sections of glass canes, known as millefiori, about 0.25 in. in diameter. These canes are made by building up a composite rod, which may be several inches across, containing the requisite design and then drawing it down to the size desired. The method of introducing millefiori canes or rods into decorative glass articles is described. Illustrated. See *Ceram. Abs.*, 22 [10] 168 (1943). V.R.E.

Glimpses of 2000 years of home life, as revealed by excavations in the north of Scotland. A. O. CURLE. *Proc. Roy. Inst. Gt. Brit.*, **31**, 463–84 (1939–1941).—Excavations on the Sumburgh Voe at the southern end of Shetland revealed constructions and a broch dating from the beginning of the Christian Era, while adjacent excavations revealed dwellings of the pre-Bronze Age through the Iron Age, culminating in a 10th to 12th century Viking settlement, all within 1.25 acres. Illustrated. V.R.E.

Latest excavations at Atchana in North Syria. L. WOOLLEY. *Proc. Roy. Inst. Gt. Brit.*, **31**, 4–8 (1939–1941); see "Atchana . . .," *Ceram. Abs.*, **19** [2] 38 (1940). V.R.E.

Stained glass. M. FORSYTH. *Pottery Gaz.*, **68** [791] 263–67 (1943).—Report of a lecture to the Burslem School of Art on the processes of making stained glass and windows. V.R.E.

Wood gas stoves. ANON. *Amer. Gas Assn. Monthly*, **24** [7] 263 (1942).—Wooden gas ranges are a remote possibility, as Midwestern stove manufacturers are considering using pressed wood fiber as an insulating material in stoves. Glass, terra cotta, and even cement are also being considered by Illinois stove manufacturers as substitutes for metal. Glass and terra cotta stoves have been produced in limited numbers. M.R.

PATENTS

Bottle. K. L. GRAHAM (Coty (England), Ltd.). Can. 416,900, Dec. 7, 1943 (Jan. 19, 1943; in Great Britain Jan. 26, 1942). G.M.H.

Decalcomania and paper. LEWIS DAVIS AND E. C. TUUKKANEN (McLaurin-Jones Co.). Can. 415,914, Oct. 19, 1943 (Nov. 10, 1941; in U. S. Feb. 7, 1941). G.M.H.

Cements

Combustion in the rotary cement kiln: Review of fuel consumption. ANON. *Cement & Lime Manuf.*, **14** [9] 143–56 (1941); **15** [3] 29–34 (1942).—The weight of fuel used for clinkering cement has been up to 40% of the clinker weight with bottle and shaft kilns. When the first rotary kilns were started, 40% or higher was originally used. This amount has been recently reduced, so that the present average in Great Britain is 27%, with some kilns running 22 to 23%. Shaft kilns probably average 18 to 24% fuel compared with rotary kilns at 22 to 27%. The most successful methods of reducing the fuel ratio have been (1) various arrangements of chains, (2) the recuperator kiln or cooler, (3) the Lepol kiln or grate, (4) the calcinator, and (5) the clinker grate cooler. The Lepol grate was tested in Japan and gave a fuel consumption of 13 to 14% (based on clinker weight) of 12,600-B.t.u. coal. The makers (Continental) guaranteed 14% fuel consumption of standard coal. A calcinator in which the slurry may remain for about 3 min. at the feed end of the kiln definitely reduces fuel consumption. The production of clinker in the rotary kiln calls for the highest flame temperature obtainable; 2500°F. or a little higher is the usual flame temperature, but 2850°F. is possible under the best conditions; every effort should be made to obtain the higher figure. The highest temperature calls for (1) minimum amount of excess air, (2) highest possible temperature of combustion air, (3) perfect mixing of the gases, and (4) good combustion-zone conditions. The most economic amount of excess air, based on fuel of 12,600 B.t.u. per lb., is 5%; this excess

allows for any reasonable variation in the heat value of the fuel and also for imperfect mixing of the combustion gases. Leakage of air should be avoided. The temperature of the combustion air during its passage through a normal cooler is 400°F., but any reasonable increase in this figure would be a definite advantage; if the increase is considerable, some detail adjustments may prove necessary. All combustion air should be passed through the clinker cooler. The calculated increase in flame temperature (all other conditions remaining the same) would be about 75°F. for each 100°F. increase in temperature of the combustion air; the actual increase, however, might be somewhat less than the calculated figure. Better combustion-zone conditions may possibly be obtained by shielding the flame and the hottest local area from the chilling effect of cold rays emanating from uncovered and unlined air-cooled surfaces. The combustion zone or area is small and should not be overloaded; otherwise it will be impossible to attain efficient combustion conditions. An overloaded zone may result in combustion being continued for some distance up the kiln, and high-grade heat will be used where full advantage cannot be taken of it; it will actually be used for duty that low-grade heat would serve equally well. As frequent change of conditions and temperature causes heat loss, continuous running and consistent operation are important. R.W.McA.

Control problems in lime manufacture. W. G. BAUER. *Pit & Quarry*, **35** [6] 51–59 (1942).—With small plants in mind, B. provides many diagrams, tables, and curves which give much valuable information. The various steps in lime manufacture, from the quarry to the keeping of statistics, are covered, including rock supply, calcination, milling, lime sampling, and control accounting. Control is maintained by five methods: (1) process and personal supervision, (2) instrument control and records, (3) sampling and analysis, (4) statistical graphing and recording, and (5) laboratory accounting and reports. M.R.

Crystals from Portland cement hydration. An electron microscope study. C. M. SLIEPCEVICH, L. GILDART, AND D. L. KATZ. *Ind. Eng. Chem.*, **35** [11] 1178–87 (1943).—An electron microscope study was made of crystals resulting from the hydration of Portland cement compounds. Calcium hydroxide yielded spheres and a fibrous mass. The dicalcium silicate hydrate appeared as rhombic slabs and possibly as amorphous spherulites. The tricalcium aluminate hydrated to form thin hexagonal plates, rhombic slabs, needles, and possibly amorphous spherulites. The amorphous spherulites could well be some form of hydrate of both of these compounds, but the photographs show that they bear a resemblance to the known calcium hydroxide. The calcium sulfoaluminate complex formed heavy needles or splines. Amorphous forms of ferrite were also observed. Illustrated. F.G.H.

Dry process versus the wet process in Portland cement manufacture. ANON. *Cement & Lime Manuf.*, **14** [12] 193–202 (1941).—The dry process of manufacture appears to be in no way unsuitable for use with materials that are initially dry (1) when water for the mix or the slurry is scarce, and (2) when the raw material as quarried has a consistent carbonate content or where the carbonate varies consistently so that its composition, as used, can be intelligently anticipated and when the material does not contain some constituent likely to prove harmful in the finished cement. The wet-process plant is alone suitable for patchy raw materials, and this plant, in conjunction with a froth flotation or other such plant, is alone suitable for use with a material that contains some constituent that has to be eliminated before the material is suitable for use. With a well-designed dry-process plant using 14% moisture in the mix, the fuel required for manufacture need be only 0.64 that required for a wet-process plant using slurry containing 40% moisture. The water required for manufacture in a dry-process plant need be only (or less than) one fourth the weight of clinker produced instead of 1.05 times the weight of clinker as required by a wet-process plant using 40% slurry; these figures ignore the initial moisture. The power required for manufacture in either type of plant is substantially the same. In many case, no difference can be assigned until the plant is designed and laid out; any assumed difference in power should not influence the choice of plant and process. Supplementary materials can be added equally well with both plants and processes. R.W.McA.

Hydration of the aluminates of calcium: V, Hydrothermal decomposition products of tricalcium aluminate at 350°C. H. JOHNSON AND T. THORVALDSON. *Can. Jour. Research*, **21** [11] 236–46 (1943).—When tricalcium aluminate is treated in saturated steam at 350°C., hydrolysis occurs with the formation of a crystalline product of the composition $4CaO \cdot 3Al_2O_3 \cdot 3H_2O$ and calcium hydroxide. The same products result when a 3:1 mixture of calcium hydroxide and hydrated alumina are similarly treated. The calcium hydroxide, as well as any hexahydrate of tricalcium aluminate formed at a lower temperature, may be removed from the hydrothermal product by extraction with a solution of acetic acid buffered with calcium acetate. The 4:3:3 calcium hydroaluminate crystallizes in colorless elongated rectangular plates with parallel extinction, positive elongation, and low birefringence. The average refractive index is close to 1.627, and the density is 2.71 (at 20°C.). The crystals are probably orthorhombic. Appreciable dehydration of the product does not occur on heating below 475° to 500°C. Dehydration between 650° and 750°C. in a stream of dry air appears to produce decomposition with the liberation of free alumina and the probable formation of the product $12CaO \cdot 7Al_2O_3$. The factors affecting the yield of the 4:3:3 calcium hydroaluminate and the mechanism of the hydrothermal reactions of tricalcium aluminate and its hydrates are discussed. Readings of X-ray powder patterns of the 4:3:3 hydroaluminate and its dehydration products are given. For Part IV see *Ceram. Abs.*, **22** [8] 133 (1943); see also "Aluminates . . .," *ibid.*, **21** [10] 207 (1942). G.A.K.

Lehigh transforms old plant at Alsen into modern cement-production unit. W. E. TRAUFFER. *Pit & Quarry*, **35** [1] 65–72, 75, 77, 79 (1942). M.R.

Lime-burning technique makes marked progress as equipment is improved. W. S. DICKIE. *Pit & Quarry*, **35** [11] 80–82, 84 (1943).—D. discusses the equipment changes and improvements during the period 1929–1939 and their effect on the product. Kilns, kiln drives, coolers, instruments, and fuels are touched upon. M.R.

Loss of water from hydrated-cement compounds in vacuum. S. L. MEYERS. *Pit & Quarry*, **35** [1] 97, 101, 103 (1942).—Experiments were performed on hydrated cement and hydrated-cement compounds at a relatively low temperature in a vacuum to show the cause of cohesion or strength and how essential to strength is the presence of water or hydrates in the hydrated cement. Samples of four pure cement compounds and of one normal cement were used. The samples were hydrated by mixing with sufficient water to make a plastic mass, placed in small stoppered vials with a few glass beads, agitated to break the first stiffening, and then stored at 70°F. for several months. They were then dried at 205°F. The amount of water lost in vacuum at any one temperature is affected to some extent by the degree of vacuum used, the time of the test, the particle size of the sample, and its pore space and degree of interconnection of pore space. The experiments also included (*a*) the effect of dehydration in vacuum on the strength of neat hydrated cement and (*b*) the theory of the forms of water in hydrated cement. Tables and charts. M.R.

More research in lime needed. ANON. *Pit & Quarry*, **35** [4] 54 (1942).—While production remains high and it is financially possible, research should be sponsored by every lime producer. Every effort should be expended to foster the continued use of lime where it is best suited for the purpose. M.R.

Operating data on rotary lime kiln using both preheater and deheater. A. D. HESSE. *Pit & Quarry*, **35** [1] 89, 91 (1942).—H. describes the system devised by the Kennedy-Van Saun Mfg. and Engineering Corp. and named after it. A Kennedy stone preheater and a Kennedy de-

heater are used in conjunction with a rotary kiln. The stone, received at 60° to 80°F., quickly attains 1250°F. or more before it enters the kiln. The calcined material passes into the deheater, where the lime is cured and then cooled. The gases enter the deheater at 1250° to 1600°F. and leave at 450° to 500°F. The preheating is done gradually, and the decline of temperature in the deheater is just as gradual. The resulting saving in fuel is obtained largely by the efficient preheating of the combustion air in the deheater. Two tables show the results of tests made when high calcium stone was burned in a kiln operated with and without a preheater and in a kiln operated with both preheater and deheater. M.R.

Second record-length kiln in service at Bellefonte. W. E. TRAUFFER. *Pit & Quarry*, **35** [11] 70–76, 78–79 (1943).—The National Gypsum Co. has installed a second kiln and other equipment in the former Chemical Lime Co. plant at Bellefonte, Pa. The new kiln, built by Traylor, is 8 x 425 ft., all welded. T. describes the equipment of the entire plant and the processing involved. Photographs. M.R.

Use of catalysts in the manufacture of Portland cements. G. A. ASH. *Pit & Quarry*, **35** [1] 63–64, 79 (1942).—A. summarizes the findings of many outstanding cement chemists as related to cement setting and hardening. Short bibliography M.R.

PATENTS

Froth flotation of cement raw materials. D. W. JAYNE, JR., S. E. ERICKSON, AND H. M. DAY (American Cyanamid Co.). U. S. 2,336,014, Dec. 7, 1943 (Sept. 28, 1940).

Hydraulic cements. A. H. G. BERRY. Brit. 557,562, Dec. 8, 1943 (May 22, 1942).

Plaster retarder. C. K. ROOS AND H. N. HUNTZICKER (Canadian Gypsum Co., Ltd.). Can. 416,692, Nov. 30, 1943 (Dec. 27, 1938; in U. S. Jan. 6, 1938). G.M.H.

Enamel

Bonding clays and the properties of synthetic molding sands. G. H. PIPER. *Proc. Inst. Brit. Foundrymen*, **32**, 33–41 (1938–1939); see *Ceram. Abs.*, **19** [9] 222 (1940). V.R.E.

Castings for enameling. J. A. DONALDSON. *Proc. Inst. Brit. Foundrymen*, **33**, 217–21 (1939–1940); see *Ceram. Abs.*, **20** [1] 7 (1941). V.R.E.

Communications equipment puts enameled resistors to severe test. ANON. *Ceram. Ind.*, **41** [1] 26, 28 (1943).—Navy specifications for enameled resistors are discussed, and a brief description of the manufacture of resistors is given. H.T.

Control of enamel slips. R. E. VIDAL. *Proc. Inst. Vitreous Enamellers*, **6**, 66–73 (1940); see *Ceram. Abs.*, **19** [5] 107 (1940). A.B. & V.R.E.

Effect of moisture on the principal properties of molding sands. J. DEARDEN. *Proc. Inst. Brit. Foundrymen*, **32**, 381–88 (1938–1939).—Moisture is probably the most important variable and the most easily controlled factor in molding sand. No general principles can be formulated from the investigation, as each sand behaves in an individual manner, but increased moisture gives reduced permeability and green strength but higher dry strength and easier ramming. V.R.E.

Enamel film strength as affected by properties of enamel before, during, and after drying. M. K. BLANCHARD AND A. I. ANDREWS. *Jour. Amer. Ceram. Soc.*, **27** [1] 25–31 (1944).—1 reference, 9 figures.

Enameling on precious metals. W. E. CHARLES. *Proc. Inst. Vitreous Enamellers*, **6**, 113–24 (1940); see *Ceram. Abs.*, **20** [1] 9 (1941). A.B. & V.R.E.

Fundamental properties of soluble salts in enamel mill liquors. M. K. BLANCHARD AND A. I. ANDREWS. *Jour. Amer. Ceram. Soc.*, **27** [1] 17–24 (1944).—15 references, 10 figures.

Glass technology as applied to the study of vitreous enamels. R. J. SLAWSON. *Proc. Inst. Vitreous Enamellers*, **6**, 125–64 (1940); see *Ceram. Abs.*, **22** [8] 134 (1943). A.B. & V.R.E.

How Porcelain Enamel Institute made a postwar market analysis. F. C. WOLESLAGLE. *Ind. Marketing*, **28** [13] 19–22, 122, 124 (1943).—The Market Research Committee of the Institute hopes to find out what can be sold in the postwar period and how much of it the market will absorb. Production in 1939 was used as a factor for evaluating productibility, and demand was based on postwar needs up to 1950. These needs were ascertained from sources within and without the trade. The committee strove to prepare a flexible market report for submission to the members of the Institute, and the study was intended to aid individual companies in a practical way. Emphasis was laid on a three-dimensional picture showing the strata, spread, and depth of the market. W. describes the process of investigation, classification of prospects, discovery of demand factors, varied bases for estimates, application of estimates, basic formulas for postwar planning, and other phases. M.R.

Principles of the enameling of cast iron. G. T. O. MARTIN. *Proc. Inst. Vitreous Enamellers*, **6**, 74–112 (1940); see *Ceram. Abs.*, **20** [1] 9 (1941). A.B. & V.R.E.

Relation of specific gravity, viscosity to dipping consistency of enamel. M. REISS. *Ceram. Ind.*, **41** [3] 34–36 (1943).—Each enamel viscosity has a definite specific gravity at which the best dipping consistency is found. A simple control system is developed from the established relationship between viscosity and specific gravity. H.T.

Synthetic molding sand. A. TIPPER. *Proc. Inst. Brit. Foundrymen*, **33**, 149–57 (1939–40); see *Ceram. Abs.*, **20** [1] 9 (1941). V.R.E.

Test methods for the evaluation of hot-water tank enamels: Discussion. G. H. MCINTYRE AND D. R. GOETCHIUS. *Bull. Amer. Ceram. Soc.*, **23** [1] 31–32 (1944). G. E. TERRY. *Ibid.*, pp. 32–33.

Use of lithium carbonate in dry-process enamels. E. L. SUTTON. *Foote-Prints*, **15** [2] 21–26 (1943).—Lithium in dry-process enamels permits deletion of a mill-addition opacifier. Although slightly more costly, the lithium-containing batch promises savings in melting time and fusing time and increased opacity. Acid resistance of the enamel is not affected. Greater uniformity, fewer pinholes, and improved glass are also reported. Used in the production of colored enamels, lithium permits an 11% decrease in coloring oxides. Excellent results should also be obtained with lithium carbonate in wet-process enamels. A.P.

Use of metallic abrasives. J. E. HURST AND W. TODD. *Proc. Inst. Vitreous Enamellers*, **5**, 70–104 (1939); see *Ceram. Abs.*, **18** [11] 292 (1939). A.B. & V.R.E.

PATENTS

Apparatus for and method of preparing fused materials. WILLIAM HOGENSON (Chicago Vitreous Enamel Product Co.). U. S. 2,337,605, Dec. 28, 1943 (Dec. 22, 1941).—A method of continuously preparing homogeneous fused enamel-forming material which includes successively heating a plurality of batches of enamel-forming material at one level so as to fuse the material, draining off the fused material to another lower level beneath the first level as the material is fused, forming the drained fused material into a stream at the lower level with any incompletely fused material floating on top of the stream, baffling the stream to insure homogeneity, and skimming the baffled stream to hold back any floating incompletely fused material from the homogeneous material before delivery thereof.

Enamel. WERNER HEIMSOETH AND ROBERT WEINIG (vested in the Alien Property Custodian). U. S. 2,337,103, Dec. 21, 1943 (July 13, 1940).—An enamel of the boro-

silicate type having the following composition in parts by weight: borax 8, feldspar 22.4, quartz 26.0, cryolite 12.4, soda ash 6.1, sodium nitrate 3.0, calcium carbonate 5.1, and sodium titanium silicate 10.0.

Process for the production of white opaque enamels. WALTER KERSTAN (vested in the Alien Property Custodian). U. S. 2,338,439, Jan. 4, 1944 (Sept. 24, 1940).—In a method of producing an article having thereon a coating of clouded vitreous enamel having an opacity substantially greater than that which could be produced with the frit used and clay alone and in which a substantial part of the increased opacity is contributed by gas bubbles retained in the enamel, incorporating in the enamel slip containing clay less than 5% of a boron compound measured as boric acid and a gas-evolving agent which, upon the firing of the enamel, evolves gases which are retained in the enamel at the firing temperature thereof in the form of bubbles of such sizes and number as to contribute a substantial increase to the opacity, the gas-evolving agent being selected from the group consisting of vinyl compounds and polymers thereof.

Glass

Changes of properties of glass resulting from changes of composition. MAURICE L. HUGGINS AND KUAN-HAN SUN. *Jour. Amer. Ceram. Soc.*, **27** [1] 10–12 (1944).—2 references.

Constitution of glass: IV. BRUNO SCHWEIG. *Glass*, **20** [10] 257–59 (1943).—S. discusses the periodic table. **V.** *Ibid.*, [11] 285–87.—The correlation between ionic potential, valence divided by ionic radius expressed in angstrom units, and glassmaking properties is discussed. In general, the higher ionic potential coincides with the greater fusing power of the element, although the reverse may be true. Glasses of a more complex composition are less prone to devitrify than those of a simple composition. For Parts **I–III** see *Ceram. Abs.*, **23** [1] 8 (1944). B.C.R.

Detection of lens defects. J. D. SPOONER. *Optician*, **105** [2719] 211–12 (1943).—The examination of lenses for defects remains largely a matter of unsystematized workshop experience. Lens defects are classed as (1) gross defects, such as breakages, chips, deep scratches, or incomplete polishing; (2) ordinary faults, visible on careful inspection without special apparatus; and (3) minor inaccuracies requiring proof plates, interferometers, etc., for their observation. Faults may occur at any stage in the making and working of a lens, but a defect is not necessarily observed at the stage during which it is introduced. Second-degree faults are usually examined under dark-ground illumination. The terminology of lens defects is by no means universally agreed upon and includes faults, sleeks, scratches, holes, pits, figure, striae, veins, feathers, gray, orange skin, and whitlow. A.P.

Electrothermal production of glass. A. G. AREND. *Elec. Times*, **99** [2587] 326–27 (1941).—Although quartz glass is commonly made by electric melting methods, ordinary glass is less often made this way. One of the principal factors is the long heating period of glass which formerly caused difficulties with transformers and switchgear. Recent efforts to revive electric heating include the use of an improved form of hearth with nonmetallic resistance rods and simplified forms of switchgear. V.R.E.

German artificial eye glass monopoly broken. ANON. *Optician*, **103** [2675] 368 (1942).—Two American firms, one in conjunction with a university research department, have undertaken to develop and supply the special small lots of glass needed for artificial eyes. The glass must flash speedily and repeatedly during working, becoming translucent or opaque at the will of the artisan. Ten shades are being supplied for the scleral portions and several additional colors in clear glass for the iris. See "Glass. . .," *Ceram. Abs.*, **20** [7] 167 (1941). A.P.

Glass cellulation produces lightweight insulation. NORMAN G. FARQUHAR. *Chem. & Met. Eng.*, **50** [8] 98–101 (1943).—Processing steps in the manufacture of Foamglas are described. The cellular structure of Foamglas is produced through the reaction of carbon with certain oxides in the molten glass to form CO and CO_2 which are trapped within the glass. In forming the blocks of Foamglas, the dry mix is placed in stainless-steel molds and passed through a furnace at 1100° to 1550°F. to produce cellulation. After proper annealing, the blocks are trimmed to size. Physical properties are given. B.C.R.

Glass properties and the periodic table. MAURICE L. HUGGINS AND KUAN-HAN SUN. *Jour. Amer. Ceram. Soc.*, **27** [1] 13–17 (1944).—6 references, 13 figures.

Glass tank problems are common but difficult to solve. ANON. *Ceram. Ind.*, **41** [1] 37 (1943).—The ideas of several plant superintendents and ceramic engineers are discussed. H.T.

Glass, the wonder material. ANON. *Pottery Gaz.*, **68** [796] 541–49 (1943).—The use of sheet, plate, safety, and ultraviolet transparent glass, glass blocks, and foam glass for constructional purposes is discussed. Illustrated. V.R.E.

Luminescent materials. A. E. HAMMOND. *Optician*, **102** [2653] 339–40 (1942).—Luminous materials can prove helpful as alternatives for artificial light, in advertising displays, and as a safeguard against accidents. A.P.

More uniform glass with better control of atmosphere and temperature. ANON. *Ceram. Ind.*, **41** [3] 48, 51–52 (1943).—Pressure in a glass tank is controlled by automatic stack-damper adjustment. The fuel-air ratio is controlled to maintain uniform CO_2 in the tank gases. Illustrated. H.T.

Optical glass goes to war. F. M. EMENS AND W. J. MOYER. *Optician*, **104** [2696] 265 (1942).—To show the importance of the optical industry in modern warfare, the evolution of fire-control instruments is reviewed. During World War I numerous sights were developed for use in firing cannon at great ranges. The ratio of men working in the optical industry to soldiers in the field increased by a large factor. Present-day warfare requires highly specialized fire-control instruments both for use in planes and for antiaircraft on the ground. An unprecedented degree of perfection in lenses, prisms, and assembly is required because of the rapidly moving targets. "Elbow" telescopes need penta and roof angle prisms which demand very accurate angles. The stereoscopic height finder contains over 100 optical elements. It detects a difference of 5 yards in the range of a moving plane 3 miles away. A.P.

Optical instrument making in South Africa. ANON. *Optician*, **105** [2725] 310 (1943).—As a wartime measure South Africa is producing lenses, prisms, and other optical components to supplement the Union's armament production. Specialized machinery was designed and constructed by the staff of the Trigonometrical Survey. The optical glass is imported. Women operators have been found to have a sensitiveness of touch ideal for precision work. A.P.

Pittsburgh, the glass center. FREDERICK W. ADAMS. *Chem. & Eng. News*, **21** [15] 1264–67 (1943).—A. presents a brief description of the production of plate glass. Illustrated. F.G.H.

Price of cullet affects its use—substitution in batch necessary. ANON. *Ceram. Ind.*, **41** [1] 35–36 (1943).—The lowest limit of cullet use in glassmaking has not been determined, but one plant runs successfully without any cullet. When the price exceeds $14.00 per ton, it is cheaper for the glass manufacturer to make his own cullet. H.T.

Production of optical flats. ANON. *Machinery* [London], **56** [1454] 625–28 (1940).—Optical flats are used as checking gauges and for measuring distance in terms of the wave length of light. Standard flats are about 1 in. square and deviate not more than 2 to 5 millionths of an

inch from perfect flatness. These are checked against a reference flat of twice this accuracy. A working outfit consists of two standard flats and a reference flat. Differences of 0.00001 in. can be measured directly and differences of 0.000005 in. by estimation. Optical flats are usually made from crystal quartz which is only furrowed when scratched, while glass is both furrowed and ridged. The quartz prisms are cut by diamond-impregnated saws, lapped with diamond dust, and finished with jeweler's rouge. The thickness of the finished flats must be accurate to within 0.00001 in. for checking micrometers. V.R.E.

Silica gel produced in Canada. ANON. *Can. Chem. & Process Inds.*, **27** [10] 567 (1943).—The process is described. The uses of silica gel include preventing the rusting of metal parts in transit. B.L.

Strength of glass. ANON. *Optician*, **104** [2714] 400 (1943).—The gap between the theoretical and the actual strength of glass constitutes one of the unsolved problems of science. Joffe explains the high strength of glass fibers and the important influence of surface condition on strength by supposing that internal faults do not matter so long as they do not reach the surface and that only the biggest faults affect the strength. Assuming a random distribution of faults, big faults will be less numerous than small ones. The smaller the surface area, the less chance there is for a "grade one" fault. A.P.

Sun-exposed glass walls provide test for solar heating. ANON. *Glass Ind.*, **24** [9] 384–85 (1943).—The Illinois Institute of Technology has recently completed a study of "insolation," or the design of buildings using large areas of glass for comfort purposes. A house in the latitude of Chicago was occupied by the owners while recording instruments, supplemented by periodic observations by members of the Institute, provided performance records. The owners enjoyed the large window areas, the extra natural illumination, the sun-basking in winter, and the sense of spaciousness. Curtains were found necessary to control glare. The combination of radiant heating through floors and auxiliary heating by solar radiation did not give expected fuel savings, and indoor temperatures rose above the comfort level. Better design of the heating system should solve these problems. A.P.

PATENTS

Alkali-resistant glaze. A. J. DEYRUP (E. I. du Pont de Nemours & Co.). U. S. 2,338,099, Jan. 4, 1944 (Dec. 1, 1941).—An alkali-resistant high lead content glaze composition suitable for decorating glassware and maturing below about 1150°F. to a glossy decorative surface coating, the glaze composition comprising lead oxide, silica, zirconium dioxide, and an alkali-metal fluoride selected from the group which consists of the fluorides of lithium, sodium, and potassium, the zirconium dioxide being present in amounts ranging from 1 to 9% by weight based on the total weight of the glaze composition and being melted into the glaze composition as a homogeneous constituent thereof.

Apparatus for coating articles. HAROLD OSTERBERG (Spencer Lens Co.). U. S. 2,337,679, Dec. 28, 1943 (Dec. 4, 1941).

Apparatus for coating fluorescent lamps. C. L. ALBRIGHT (Sylvania Electric Products, Inc.). U. S. 2,337,740, Dec. 28, 1943 (Sept. 4, 1941).

Apparatus for forming insulators. M. K. HOLMES (Owens-Illinois Glass Co.). U. S. 2,336,864, Dec. 14, 1943 (July 12, 1941).

Apparatus for inspecting glass. T. B. DRESCHER (Bausch & Lomb Optical Co.). U. S. 2,337,877, Dec. 28, 1943 (March 7, 1942).

Apparatus for surfacing glass. F. W. ADAMS AND M. L. DEVOL (Pittsburgh Plate Glass Co.). U. S. 2,337,435, Dec. 21, 1943 (Jan. 2, 1941).

Apparatus for tempering glass. L. J.-B. FORBES AND JAMES HEATON (American Securit Co.). U. S. 2,336,170, Dec. 7, 1943 (May 17, 1939).

Apparatus for tempering glass bottles, etc. C. E. MONGAN, JR. (Hartford-Empire Co.). U. S. 2,338,071, Dec. 28, 1943 (May 22, 1941).

Coating glass tubes. G. A. MICHAEL (Sylvania Electric Products, Inc.). U. S. 2,337,524, Dec. 21, 1943 (Nov. 2, 1940).

Compound glass sheet. J. H. LEWIS (Blue Ridge Glass Corp.). U. S. 2,337,757, Dec. 28, 1943 (Nov. 25, 1938).—A blackboard including a sheet of glass consisting of two outer layers of high heat diffusivity and an inner layer of opaque glass of low heat diffusivity, the layers being welded together and the sheet having a wire reinforcement imbedded therein.

Electric furnace for glass. YVAN PEYCHES (Pilkington Bros., Ltd.). Can. 416,935, Dec. 7, 1943 (Sept. 11, 1939). G.M.H.

Evaporation of transparent material on glass. G. L. DIMMICK (Radio Corp. of America). U. S. 2,338,234, Jan. 4, 1944 (Jan. 2, 1941).—The method of providing an evaporated coating of minimum reflection on a refractive medium comprising the steps of directing a light beam onto a surface of a refractive material in an evaporating apparatus, directing the reflected portion of the beam through a color-selective filter onto a photocell, determining the current through the photocell, evaporating the material onto the surface, and stopping the evaporation when the current through the photocell reaches a momentarily stationary value.

Fabricating multiple glass sheet glazing units. J. J. HOPFIELD (Libbey-Owens-Ford Glass Co.). U. S. 2,336,544, Dec. 14, 1943 (April 22, 1939).

Fiber-glass gasket for bottles. J. F. HYDE (Fiberglas Canada, Ltd.). Can. 416,295, Nov. 9, 1943 (July 26, 1938; in U. S. Oct. 9, 1937). G.M.H.

Formation of thin films on glass surfaces. P. W. FRENCH (Pittsburgh Plate Glass Co.). U. S. 2,337,460, Dec. 21, 1943 (Feb. 25, 1942).

Forming hollow glassware. H. A. WADMAN (Hartford-Empire Co.). U. S. 2,336,822, Dec. 14, 1943 (May 9, 1942).

Forming lightweight glass containers of novel distribution. H. A. WADMAN (Hartford-Empire Co.). U. S. 2,336,821, Dec. 14, 1943 (May 9, 1942).

Glass ampoule trimming machine. L. E. CLINE (Kimble Glass Co.). Can. 416,469, Nov. 16, 1943 (April 18, 1941; in U. S. May 3, 1940). G.M.H.

Glass-marking composition. W. F. GOEPFERT (Interchemical Corp.). U. S. 2,338,176, Jan. 4, 1944 (May 13, 1941).—A glass-marking pencil consisting of 14 to 20% of an amide of a nondrying fatty acid having 12 to 20 carbon atoms, 4 to 10% of a resin compatible therewith, 15 to 25% of a hard vegetable wax, 20 to 28% of a softener mixture comprising a major proportion of oil of the class consisting of mineral oil and lard oil and a minor proportion of a grease of the class consisting of petrolatum and lanolin, and the remainder pigment, dyestuff, filler, and oil-soluble dispersing agent.

Glassmaking apparatus. J. B. WHITMORE AND F. A. NEWCOMBE (Canadian Westinghouse Co., Ltd.). Can. 416,884, Dec. 7, 1943 (Aug. 29, 1940; in U. S. Sept. 1, 1939). G.M.H.

Glassmelting tank. W. W. OAKLEY (Corning Glass Works). Can. 416,145, Nov. 2, 1943 (Nov. 21, 1941; in U. S. Dec. 26, 1940). G.M.H.

Glass-to-metal seal. HANS PULFRICH AND RICHARD MAGNER (General Electric Co.). U. S. 2,338,538, Jan. 4, 1944 (June 1, 1939).

Glass-scoring machine. J. S. HARKER (Kimble Glass Co.). U. S. 2,337,888, Dec. 28, 1943 (Dec. 6, 1941).

Glassware blowing and cooling apparatus. W. K. BERTHOLD (Dominion Glass Co., Ltd.). Can. 416,147, Nov. 2, 1943 (Dec. 15, 1941). G.M.H.

Glassware forming apparatus. G. E. ROWE (Hartford-Empire Co.). Can. 417,258, Dec. 21, 1943 (Aug. 25, 1942; in U. S. Sept. 13, 1941). G.M.H.

Glassware manufacture. W. K. BERTHOLD (Dominion Glass Co., Ltd.). Can. 415,763, Oct. 12, 1943 (May 14, 1942). G.M.H.

Hardening glass plates, etc. LAMBERT VON REIS (American Securit Co.). U. S. 2,336,200, Dec. 7, 1943 (Nov. 1, 1937).—The method of producing a hardened glass object which consists in heating the object to approximately the softening point, thereafter rapidly chilling the object in a vertical position and supporting the object at a plurality of spaced points of small dimension throughout its area to prevent a substantial movement of the object during the heating and chilling.

High-frequency current for sealing off lamps. G. C. HOLLOWAY (Canadian Westinghouse Co., Ltd.). Can. 416,883, Dec. 7, 1943 (Aug. 13, 1940; in U. S. Sept. 29, 1939). G.M.H.

Laminated glass. F. R. CONKLIN AND J. D. RYAN (one half to Libbey-Owens-Ford Glass Co. and one half to Eastman Kodak Co.). U. S. 2,336,531 and 2,336,532, Dec. 14, 1943 (July 11, 1939).

Lehr for glassware. D. G. MERRILL (Dominion Glass Co., Ltd.). Can. 416,744, Nov. 30, 1943 (May 3, 1941). G.M.H.

Lens. G. H. AKLIN (Eastman Kodak Co.). U. S. 2,336,207, Dec. 7, 1943 (Oct. 8, 1941). U. S. 2,338,614, Jan. 4, 1944 (June 17, 1942). WILLY SCHADE (Eastman Kodak Co.). U. S. 2,336,300, Dec. 7, 1943 (Sept. 17, 1941).

Long focal length lens. WILLY SCHADE, KARL TOLLE, AND WESLEY VAN GRAAFEILAND (Eastman Kodak Co.). U. S. 2,336,301, Dec. 7, 1943 (May 8, 1942).

Long focal length lens. WILLY SCHADE, KARL TOLLE, AND W. VAN GRAAFEILAND (Canadian Kodak Co., Ltd.). Can. 416,741, Nov. 30, 1943 (Jan. 13, 1943; in U. S. May 8, 1942). G.M.H.

Machine for grinding the edges of lenses or lens forms. A. G. CHAMPION. Brit. 557,278, Nov. 24, 1943 (July 20, 1942).

Making filaments consisting of pure silicic acid. FRANZ SKAUPY AND GUSTAV WEISSENBERG (vested in the Alien Property Custodian). U. S. 2,338,463, Jan. 4, 1944 (Aug. 18, 1939).—Process of making silica filaments in which the silicon ingredient is pure silicic acid comprising producing an intermediate filament by spinning at a spinning temperature below that of pure silicic acid a compound substantially consisting of a base radical and a silicic acid radical and having a correspondingly lower melting point than pure silicic acid and converting the intermediate filament into a silica filament by vigorously treating it with an acid substance capable of reducing the compound to pure silicic acid.

Making glass structures by pressing and blowing operations. EUGENE SCHWARZ (Mantle Lamp Co. of America). U. S. 2,338,269, Jan. 4, 1944 (Jan. 13, 1941).

Making sealing glasses. R. H. DALTON (Corning Glass Works). U. S. 2,336,227, Dec. 7, 1943 (July 20, 1940).

Manufacture of multicellular glass. BERNARD LONG (vested in the Alien Property Custodian). U. S. 2,337,672, Dec. 28, 1943 (Nov. 28, 1939).—A process of manufactured multicellular glass comprising mixing powdered glass, an oxide of a metal, the metal having a volatilization point below the temperature at which the glass welds to itself and therefore a high vapor tension at such temperature, and pulverized carbon, heating the mixture to the temperature and thereby causing a reaction between the carbon and the metal oxide to produce within the glass mixture, constituted by glass particles welded to each other, carbon dioxide and metal vapor so as to form in the glass mass bubbles containing the carbon dioxide and metal vapor, and then cooling the glass mass while retaining the bubbles therein to produce multicellular glass.

Method and apparatus for producing glass fibers. GEDEON VON PAZSICZKY (vested in the Alien Property Custodian). U. S. 2,338,473, Jan. 4, 1944 (Nov. 6, 1939).

Method and apparatus for producing hollow glass blocks. H. M. LOUDEN AND C. W. MCCREERY (Owens-Illinois Glass Co.). U. S. 2,336,874, Dec. 14, 1943 (Dec. 27, 1941).

Method for prevention of sulfate deposits on glass. E. W. GUERNSEY (Consolidated Gas Electric Light & Power Co. of Baltimore). U. S. 2,336,785, Dec. 14, 1943 (April 22, 1941).—As an improvement in that method of preventing sulfate coatings on glass during annealing which employs the coating of the conveyer belt with an alkaline reacting compound that will absorb sulfurous gases in the lehr, the step of forming alkaline reacting compound on the belt by decomposing sodium acetate applied thereto by the heat of the annealing lehr to form a closely adherent nonflaking coating of sodium carbonate.

One-piece plurifocal lens. W. R. UHLEMANN (Uhlemann Optical Co.). U. S. 2,336,322, Dec. 7, 1943 (Feb. 23, 1940).

Photographic lens. M. J. HERZBERGER AND H. O. HOADLEY (Canadian Kodak Co., Ltd.). Can. 416,727, Nov. 30, 1943 (March 18, 1942; in U. S. Oct. 29, 1941). G. H. AKLIN (Canadian Kodak Co., Ltd.). Can. 416,728 and 416,729, Nov. 30, 1943 (March 23, 1942; in U. S. Oct. 8, 1941). Can. 416,736, Nov. 30, 1943 (Jan. 13, 1943; in U. S. June 17, 1942). WILLY SCHADE (Canadian Kodak Co., Ltd.). Can. 416,732, Nov. 30, 1943 (April 11, 1942; in U. S. Sept. 17, 1941). F. E. ALTMAN (Canadian Kodak Co., Ltd.). Can. 416,737, Nov. 30, 1943 (Jan. 13, 1943; in U. S. May 11, 1942). M. J. HERZBERGER (Canadian Kodak Co., Ltd.). Can. 416,739, Nov. 30, 1943 (Jan. 13, 1943; in U. S. June 6, 1942). RUDOLF KINGSLAKE AND MAX REISS (Canadian Kodak Co., Ltd.). Can. 416,740, Nov. 30, 1943 (Jan. 13, 1943; in U. S. May 23, 1942). G.M.H.

Producing laminated safety glass. J. D. RYAN (Libbey-Owens-Ford Glass Co.). U. S. 2,337,275, Dec. 21, 1943 (Jan. 29, 1943).

Producing plate and thick glass. A. E. SPINASSE. U. S. 2,336,510, Dec. 14, 1943 (Sept. 25, 1939).

Reduction in reflection from transparent material. G. L. DIMMICK (Radio Corp. of America). U. S. 2,338,233, Jan. 4, 1944 (July 31, 1940).—An optical element and a reflection-reducing coating thereon comprising the evaporation product of a mixture of calcium fluoride and aluminum oxide.

Safety mechanism for glassware-forming machines. E. G. BRIDGES (Lynch Corp.). U. S. 2,336,162, Dec. 7, 1943 (Feb. 1, 1940).

Sheet glass tempering apparatus. ALBERTO QUENTIN. Can. 416,968, Dec. 7, 1943 (July 28, 1939). G.M.H.

Tank furnace for glass. YVAN PEYCHES (Pilkington Bros., Ltd.). Can. 416,936, Dec. 7, 1943 (Sept. 11, 1939). G.M.H.

Telephoto lens. WILLY SCHADE (Canadian Kodak Co., Ltd.). Can. 416,734, Nov. 30, 1943 (Aug. 5, 1942; in U. S. April 24, 1942). G.M.H.

Treating ferrous metal articles with glass coatings. J. J. CAUGHERTY. U. S. 2,337,186, Dec. 21, 1943 (Sept. 9, 1942).—In a method of producing a clean, oxide-free surface on wire, etc., the steps of passing a wire through a bath of molten glass to apply a coating of molten glass thereto, controlling the thickness and uniformity of thickness of the coating, cooling the glass-coated wire, and then separating the glass from the wire by flexing the wire.

Wide band photographic lens. WILLY SCHADE (Canadian Kodak Co., Ltd.). Can. 416,735, Nov. 30, 1943 (Dec. 12, 1942; in U. S. July 7, 1942). G.M.H.

Structural Clay Products

Brick, clay handling costs must take downward trend. EZRA W. CLARK. Presented at meeting of American Society of Tool Engineers; abstracted in *Brick & Clay Record*, **103** [6] 46 (1943).—In the brick and clay industry, 45% of the production costs is represented by unskilled labor in the handling of 75 million tons of material. Handling of brick may be greatly speeded up through the use of power trucks capable of tiering skids. These trucks can handle 3 tons in each load, while a man with a wheelbarrrow can handle only a maximum of 700 lb. Postwar

plans for newly designed clay-products plants take into account a reduction in unskilled labor costs. B.C.R.

Brick domes. W. J. PALMER-JONES. *Brit. Clayworker*, **52** [619] 98–99 (1943).—The use of traditional Byzantine or Arab-type domes is suggested as an alternative method of roofing in postwar construction, with the object of eliminating the use of timber and steel necessary for the support of ordinary roofs. Illustrated. V.R.E.

Common deairing problems—their solution. ANON. *Brick & Clay Record*, **103** [6] 51 (1943).—Hairline cracks may be due to worn oil rings; longitudinal cracks are sometimes caused by the auger speed being greater than the material flow. Cracks and voids running in all directions have been traced to worn augers and liners and liners of the wrong design. Lamination cracks have been traced to a die with too much taper. B.C.R.

News. ANON. *Architectural Forum*, **79** [6] 46 (1943).—Strong disciples of modular standards advocated by the late Albert Bemis, founder of the Modular Service Assn., include the Structural Clay Products Institute, whose manufacturing membership has agreed to manufacture brick and tile products in unit sizes of 4 in. or a multiple thereof, which is the nominal wall thickness of most American houses. The board of directors of the National Concrete Masonry Assn. has passed a resolution favoring this proposed A.S.A. basis for the coordination of concrete masonry. See following abstract. M.E.P.

Proposed American Standard Basis for the Coordination of Dimensions of Building Materials and Equipment—A62.1. ANON. *Bull. Amer. Ceram. Soc.*, **23** [1] 28–31 (1944); see *ibid.*, **22** [12] 417–18 (1943).

Reinforced concrete pipe used for underfloor air ducts at new plant. S. M. BROWN. *Heating, Piping & Air Conditioning*, **14** [5] 282, 286 (1942).—To avoid large overhead ducts in the new fluorescent-lamp plant of the Hygrade Sylvania Corp., it was decided to use concrete ducts under the floor to carry 100,000 cu. ft. per min. of air for cooling purposes. As concrete tunnels were considered too costly, reinforced concrete pipe was used; 82-in. pipe was the largest obtainable, and a dual system was laid out using one 82-in. pipe and one 54-in. pipe. Salt-glazed vitrified tile was used for branch lines. The tile were inserted at a 45° angle into the concrete pipe and cemented into place. All vertical risers were changed to sheet metal at the first-floor level. M.R.

Refractories

Boiler firebox maintenance. K. STEINER. *Heating, Piping & Air Conditioning*, **14** [10] 610–12 (1942); **15** [4] 174–75 (1943).—Boiler refractories require proper maintenance at any time, and such care is more important when plants are operating under war loads. To acquaint operating engineers with some of the problems involved, S. discusses various elements entering into the boiler-furnace lining and insulation. He describes the types of firebrick, their method of manufacture, their application, and plastic firebrick or "ramming mixture." Information on bonding cements and insulating brick and concrete is also given. He discusses the limitations of the materials used in boiler settings and explains some of the actions which cause firebox failures, viz., spalling, fusion, and slagging. The operating engineer is admonished to be constantly alert for any signs of deterioration in the firebox. Some remedies are suggested which would prove helpful in preventing serious trouble to firebox refractories. Emphasis is laid on the selection of materials entirely suitable for the service required. See "Fuel. . .," *Ceram. Abs.*, **22** [10]180 (1943). M.R.

Brucite magnesia. M. F. GOUDGE. *Jour. Amer. Ceram. Soc.*, **27** [1] 8–10 (1944).—1 reference. See "Magnesia. . . ," *Ceram. Abs.*, **20** [1] 29 (1941); "Sources. . . ," *ibid.*, **21** [8] 177 (1942).

Modern ingot-heating furnace. E. G. SMITH. *Iron & Steel Engr.*, **20** [10] 62–65 (1943).—A diagram of a refractory recuperator is included. B.L.

More about grog. ANON. *Brit. Clayworker*, **52** [619] 106–107 (1943).—The three advantages of grog over raw clay are as follows: (1) it can be fired at any desired temperature to eliminate shrinkage; (2) fusible material is easily recognized and removed; and (3) the particles can be of any size. The mixing, firing, sorting, and crushing and screening of grog are discussed. Investigations into grog particle size show that (1) shrinkage increases with fineness of the grog and is inversely proportional to the quantity; (2) the porosity increases with particle size and amount of grog; and (3) crushing strength is greatest with the finest grog, while the effect of molten glass and slag depends chiefly upon the porosity and leanness of the material. V.R.E.

Plastic-refractory manufacturing offers wartime diversion of products. H. L. LONGENECKER. *Brick & Clay Record*, **103** [5] 39–40 (1943).—L. discusses the equipment and materials required in the manufacture of plastic refractories and their installation in service. B.C.R.

PATENTS

Assay crucible. R. S. BRADLEY (A. P. Green Fire Brick Co.). Can. 416,460, Nov. 16, 1943 (Feb. 14, 1941; in U. S. Dec. 30, 1940). G.M.H.

Bonded refractory. V. M. GOLDSCHMIDT. Can. 415,840, Oct. 12, 1943 (Aug. 29, 1940). G.M.H.

Furnace linings. OUGHTIBRIDGE SILICA FIREBRICK CO., LTD., AND S. BROOKE. Brit. 557,599, Dec. 8, 1943 (July 8, 1942).

Refractory composition. R. V. KLEINSCHMIDT AND EDWARD WASHKEN (Bethlehem Steel Co.). U. S. 2,336,360, Dec. 7, 1943 (April 23, 1941).—A refractory composition suitable for use in contact with iron oxide-containing basic slag consisting of a mixture having the following analysis: magnesia 60 to 85, alumina 12.5 to 25, silica 10 to 15, and chrome to a maximum of 5%.

Zircon refractory and method of making. R. K. SMITH (Corning Glass Works). U. S. 2,338,209, Jan. 4, 1944 (Dec. 20, 1941).—A refractory composition comprising a major proportion of refractory zirconium material and about 1% of an oxide of vanadium.

Terra Cotta

Heat shock resisting bodies now produced by stoneware manufacturers. J. M. ROBITSCHEK. *Ceram. Ind.*, **41** [1] 48–51; [3] 64, 66 (1943).—A history of the stoneware industry is given. Bodies with higher resistance to thermal shock have been developed by replacing the silica minerals by fused silica of low coefficient of expansion or by the formation of silicates and glassy matrix of low expansion. H.T.

Lily Saarinen's architectural ceramics. ANON. *Architectural Forum*, **79** [6] 2 (1943).—A review of Lily S. Saarinen's recent exhibit of ceramic sculpture at the Midtown Gallery illustrates the adaptability of this medium to architectural detail. It affords a pleasant contrast in texture to brick walls and introduces accents of color in a variety of intensities. Examples in this show include a sloth with a silver luster finish. An imaginative group, "Mowgli & Bageera," to decorate a schoolyard, is highly glazed in blue-green; other pieces have a clay finish flecked with metal. Her simple and whimsical work is well subordinated to architecture, withstands frost, and is practical for the energetic handling by children. Illustrated. M.E.P.

Whiteware

Engineers speculate on change in whiteware processing. ANON. *Ceram. Ind.*, **41** [4] 68 (1943). H.T.

Minton's 150th birthday. ANON. *Pottery Gaz.*, **68** [790] 219–21 (1943).—The history and products of this pioneer pottery firm are reviewed. Illustrated. V.R.E.

Particulate characteristics of commercial flint and feldspar. R. RUSSELL, JR., AND R. S. WEISZ. *Jour. Amer. Ceram. Soc.*, **27** [1] 1–7 (1944).—26 references, 5 figures.

Production and testing specifications for sanitary ware. ANON. *Ceram. Ind.*, **41** [4] 64–66 (1943).—Commercial Standard CS111–43, effective for new production October 15, 1943, and accepted as standard by the industry, is summarized. H.T.

Proprietary products need containers—whiteware can be used. ANON. *Ceram. Ind.*, **41** [1] 46 (1943). H.T.

Symposium on testing and classification of ball clays: open letter to Chairman of White Wares Division Committee on Research. HEWITT WILSON. *Bull. Amer. Ceram. Soc.*, **23** [1] 25–28 (1944); see *ibid.*, **21** [11] 248–91 (1942).

PATENTS

Aircraft spark plug. HECTOR RABEZZANA (General Motors Corp.). U. S. 2,336,569, Dec. 14, 1943 (Oct. 13, 1941).

Ceramic article and method of making. T. G. McDOUGAL AND KARL SCHWARTZWALDER (General Motors Corp.). U. S. 2,336,182, Dec. 7, 1943 (May 31, 1940).—A ceramic product made by firing a ceramic mixture showing upon chemical analysis approximately 1 to 98% beryllium oxide, 1 to 40% magnesium oxide, and the remainder alumina together with up to 20% silica.

Ceramic composition and article. T. G. McDOUGAL AND KARL SCHWARTZWALDER (General Motors Corp.). Can. 416,458, Nov. 16, 1943 (June 21, 1940; in U. S. June 29, 1939). G.M.H.

Deflocculant for clays. F. P. HALL (Onondaga Pottery Co.). U. S. 2,337,597, Dec. 28, 1943 (Oct. 29, 1941).—The method of deflocculating clay slips which includes adding barium carbonate and sodium metaphosphate, the two together not being in excess of 0.5% of the solids in the slip.

Lowering the gravity and increasing the casting rate of clay slips. F. P. HALL (Onondaga Pottery Co.). U. S. 2,337,598, Dec. 28, 1943 (Oct. 29, 1941).—The method of lowering the specific gravity and increasing the casting rate of clay slips which consists in adding metal stearate to the slip.

Making high strength ceramic surfaces. K. E. STETTINIUS AND B. F. DEWEY (Lapp Insulator Co., Inc.). U. S. 2,337,691, Dec. 28, 1943 (April 29, 1942).—The method of producing a porcelain body with a roughened surface which includes the steps of applying, to part of the surface of the body, roughness elements of material which will have, after firing, a coefficient of thermal expansion less than that of the porcelain body and then firing the body to cause the roughness elements to become firmly held to the body.

Porcelain-to-metal sealing process. P. R. KALISCHER AND H. H. SCHMITT (Canadian Westinghouse Co., Ltd.). Can. 415,759, Oct. 12, 1943 (May 7, 1942). G.M.H.

Rendering clays filterable. F. P. HALL (Onondaga Pottery Co.). U. S. 2,337,599, Dec. 28, 1943 (Oct. 29, 1941).—That step in the manufacture of alkaline deflocculated slips of kaolin or gel-forming clay minerals which comprises filtering the slips to which acetate ions have been added in amounts of 0.05 to 5% of the solids in the slips.

Shielded spark plug for aircraft engines. HECTOR RABEZZANA (General Motors Corp.). U. S. 2,336,570, Dec. 14, 1943 (Nov. 27, 1941).

Spark-plug insulator. F. H. RIDDLE (Champion Spark Plug Co.). U. S. 2,337,930, Dec. 28, 1943 (March 10, 1938).—A substantially nonporous electric insulator consisting of at least 80% alumina and the remainder consisting principally of beryllium compounds, magnesium compounds, and calcium compounds.

Spark-plug insulator. KARL SCHWARTZWALDER (General Motors Corp.). Can. 416,457, Nov. 16, 1943 (June 20, 1940). G.M.H.

Spark plugs and means for mounting. W. J. MORISON AND EASTERN NATIONAL OMNIBUS CO., LTD. Brit. 556,790, Nov. 3, 1943 (June 12, 1942).

Equipment and Apparatus

Application and testing of luminous compounds. O. M. FERGUSON. *Optician*, **105** [2717] 179, 182 (1943).—Before application, the material is tested for light output by photometric means. Activity is measured by a gold-leaf electroscope, comparing with a standard radioactive substance. A.P.

Economy in the industrial use of electricity. J. G. BERNARD. *Fuel Econ. Rev.*, **21**, 8–12 (1942).—B. discusses the prevention of waste of light, power, and heat and presents curves showing the power factor and efficiency for typical motors of various sizes from which the load can be calculated for any ammeter reading according to the formula for 3-phase a.-c. supply, $H = (1.73/746) \times \text{Volts} \times \text{Amperes} \times \text{Efficiency} \times \text{Power factor}$. V.R.E.

Electronic microscope. H. W. GIBSON. *Optician*, **103** [2668] 241–44 (1942).—G. outlines the general principles of the electron microscope and its analogy to the optical system of the light microscope. A.P.

Fundamentals of grinding. D. C. McLAREN. *Can. Mining Jour.*, **64** [11] 705–11 (1943).—The output of a grinding unit is affected by several factors, e.g., character and weight of feed and grinding media, character of grinding unit and liner, rate of flow, and type of circuit. It is therefore necessary to have a large variety of grinding units to handle the same tonnages. The efficiency of grinding units is primarily a matter of economics. G.M.H.

Improved laboratory polariscope of simple design. JOHN GALLUP. *Bull. Amer. Ceram. Soc.*, **23** [1] 38–39 (1944).—2 figures.

Infrared penetrates many process industries. E. H. ROBINSON. *Chem. & Met. Eng.*, **50** [8] 105–106 (1943). B.C.R.

Modern measuring instruments and the principles of their design. G. SCHLESINGER. *Machinery* [London], **56** [1459] 782–87 (1940); **57** [1460] 12–17; [1461] 37–40 (1940).—S. discusses (1) mechanical methods, including screws, levers, gears, and spirit levels, (2) optical methods of magnification, (3) microcomparator gauges, and (4) active calibration methods. V.R.E.

"Near infrared," what it is, where you can use it. ANON. *Ceram. Ind.*, **41** [3] 28–30 (1943).—Infrared heating is ideal for drying glazes, colors, and enamels. Sources of infrared light are described, such as infrared lamps and radiant gas-fired heaters. Illustrated. H.T.

Optical aids to production. ANON. *Optician*, **104** [2701] 347 (1943).—The optical projection machine is used in gauging fine wire, examining the mesh of sieves, and observing surface finish and assists in the production of intricate tools and gauges. Microscopes are used on measuring machines for length gauges, on machine tools to measure coordinate movements, and to control accurate profile grinding. The interferometer helps in the manufacture of gauge blocks and their calibration to a millionth of an inch. A.P.

Optical projection. ANON. *Optician*, **105** [2710] 67–68 (1943).—Optical projection has become a major feature of modern life. Projectors may be classified as those which project a shadow, a light spot (optical levers), a transparency (diascopes), an opaque object (episcopes), or an image at infinity (light projectors). In machine work, projectors reduce fine and exact operations to a condition where only the coarsest visual act is required. Parts actually on the lathe can be checked directly against a master drawing. Microfilm readers and color-film viewers

will have important postwar development. Signal-lamp improvements during the war should help solve headlight problems. A.P.

Power-factor correction reduces brickmaking costs. ANON. *Elec. Times*, **99** [2583] 264 (1941).—Considerable economy was effected at an all-electric brick plant in England by the installation of an autosynchronous motor on the larger drive to maintain the power factor at unity, the maximum demand proving to be 65 kva. Recently, owing to the varying load factor, a tariff allowing a rebate of 15% for 0.95 lagging and 20% for unity power factor has been in operation. The annual saving effected on power is about £330 on a total power bill of £2000. V.R.E.

Precision universal measuring apparatus. ANON. *Machinery* [N. Y.], **50** [4] 208 (1943).—A universal precision measuring apparatus or instrument, designated MU-214B, which offers an exceptionally wide range of application has been brought out by the Société Genevoise d'Instruments de Physique, Geneva, Switzerland, and is being introduced in the U. S. and Canada by the Cosa Corp., New York, N. Y. The instrument can be used for all measurements of components ranging from the size of a tiny clock wheel up to that of the usual machine part. R.H.B.

Quarrying. ANON. *Mine & Quarry Eng.*, **7** [12] 287–90 (1942).—The methods available for breaking ground, loading, transporting, crushing, grinding, and screening are discussed. V.R.E.

Quartz crystals. ANON. *Chem. Eng. & Mining Rev.*, **35** [419] 303–306 (1943).—Quartz crystals must weigh not less than 0.5 lb., must be not less than 1 in. across the narrowest dimension, and must contain a 1-in. cube free from cloudiness, flaws, and bubbles. Other factors relating to quality, dimensions, markings, and occurrence are discussed. B.C.R.

Recovery of valuable material by electrostatic separation. H. B. JOHNSON. *Chem. & Met. Eng.*, **50** [11] 130–33 (1943).—Owing to a greatly improved understanding of the electrostatic properties of minerals and nonminerals, many successful applications in chemical, metallurgical, and other fields are possible. Typical applications and separations and their costs are cited. B.C.R.

Simplified air permeability fineness apparatus. RAYMOND L. BLAINE. *ASTM Bull.*, No. 123, pp. 51–55 (1943).—An apparatus designed for measuring the fineness of granular materials is analogous to the U-tube viscometer, in which the liquid in the U tube provides the pressure difference and also indicates the volume of flow. The apparatus is easy to make and operate. The results of tests with Portland cement indicate that the values obtained are reproducible and in agreement with values obtained with the Lea-Nurse type of air-permeability apparatus. B.C.R.

Stone crushers. ANON. *Mine & Quarry Eng.*, **7** [11] 268–70 (1942).—The characteristics of jaw, gyratory, and roll crushers and of hammer mills are described, together with the principal properties of the products. V.R.E.

Theoretical notes on stone crushers. ANON. *Mine & Quarry Eng.*, **8** [6] 123–25 (1943).—The mechanics of crushing with jaw crushers, gyratory crushers, and crushing rolls and the limits of size reduction possible are described. Illustrated. V.R.E.

Utilization of waste heat from industrial operations. W. H. DICKINSON. *Engineer*, **176** [4584] 410–12; [4585] 432–34 (1943).—Methods of using waste heat can be classed as (1) convection, (2) transfer, (3) regenerator, (4) thermal storage or steam accumulator system, (5) burning, and (6) soaking methods. G.A.K.

PATENTS

Apparatus for mixing powdered materials. A. C. EVANS (Scovill Mfg. Co.). U. S. 2,336,438, Dec. 7, 1943 (March 6, 1942).

Automatic decalcomania paper stripper. D. S. MACKIE (General Motors Corp.). U. S. 2,337,724, Dec. 28, 1943 (March 18, 1942).—A decalcomania or transfer paper stripping apparatus comprising a work conveyer which moves a panel bearing the transfer paper and an air nozzle located above the conveyer and directing air in a direction near parallelism with the conveyer and the panel for blowing the transfer paper off the work panel.

Ceramic article coating device. E. H. FISCHER (Canadian Westinghouse Co., Ltd.). Can. 417,221, Dec. 21, 1943 (July 30, 1941). G.M.H.

Drilling mud. R. B. BOOTH (American Cyanamid Co.). Can. 416,679, Nov. 30, 1943 (Jan. 7, 1942; in U. S. March 7, 1941). Can. 416,680, Nov. 30, 1943 (Jan. 22, 1942; in U. S. March 27, 1941). E. E. POST AND C. F. BONNET (American Cyanamid Co.). Can. 416,681, Nov. 30, 1943 (Jan. 22, 1942; in U. S. March 27, 1941). R. B. BOOTH AND M. W. SAVAGE (American Cyanamid Co.). Can. 416,682, Nov. 30, 1943 (April 15, 1942; in U. S. June 11, 1941). G.M.H.

Method and apparatus for manufacturing pottery ware. W. J. MILLER. U. S. 22,405, Dec. 14, 1943 (Aug. 3, 1943); reissue of original U. S. 2,243,880, June 3, 1941 (March 20, 1936), a division of U. S. 2,046,525, July 7, 1936 (March 1, 1929); reissue U. S. 22,187, Sept. 29, 1942 (April 24, 1942).

Piezoelectric crystal apparatus. R. A. SYKES (Western Electric Co., Inc.). Can. 416,047, Oct. 26, 1943 (Dec. 20, 1939). G.M.H.

Piezoelectric crystal element. W. P. MASON (Western Electric Co., Inc.). Can. 416,355, Nov. 9, 1943 (Jan. 28, 1942). G.M.H.

Kilns, Furnaces, Fuels, and Combustion

Basic principles of pulverized fuel firing. W. M. COURT. *Nat. Engr.*, **45** [7] 455 (1941).—To ensure efficient results from the use of pulverized fuel, both the furnace and the burners should be designed to meet the combustion requirements. Fine pulverization means 85 to 95% through a 200-mesh and 60 to 75% through a 300-mesh screen. With fine pulverization the fuel closely approaches a true gaseous state, and thus complete combustion is obtained. M.R.

Bureau of Mines studying stockpiling of coal. ANON. *Heating, Piping & Air Conditioning*, **14** [11] 668 (1942).—The Division of Solid Fuels Utilization for War of the Bureau of Mines is organizing a group of experts to advise industries on the best methods of stockpiling coal. Tests made recently show that most coals lose little of their heating value through storage. The best coals lose about 1.2% during the first year and 2.1% in two years. Poorer coals may lose as much as 2 or 3% in the first year and as much as 5% in three years. M.R.

Buying and checking fuel. R. E. HIERONYMUS. *Heating, Piping & Air Conditioning*, **14** [1] 11–14; [2] 96–99 (1942).—Buying coal on the guaranteed basis proved an effective way of protecting the consumer's interest. When a routine analysis of the coal used by a building-management firm in one year showed 88% to be of a lower B.t.u. content than represented and only 12% to be higher than represented, it was thought advisable to use a contract form which provided for (1) the guaranteed heating value of coal, (2) provisions for testing, and (3) penalties for poor performance. Records kept for the following year showed greater fuel efficiency. The analysis made from the bins compared more favorably with the guaranteed analysis of the dealers, and the percentage of cases where the coal was above the represented value increased sharply. Charts and the contract form are given. Commercial coal-testing procedure is briefly described, and a sample analysis is given in which the B.t.u. value falls below that stipulated in the contract. According to the contract, this compelled the supplier to pay for the coal analysis and allow credit for the low B.t.u. value. M.R.

Clayworking: II, Burning. ANON. *Brit. Clayworker*, **50** [596] 94 (1941).—A review is given of (1) intermittent

kilns, including (*a*) updraft, (*b*) horizontal draft, (*c*) downdraft, and (*d*) muffle kilns, and (2) continuous kilns, including (*a*) those in which the goods to be fired are stationary and the fire travels around and (*b*) the tunnel type in which the goods run through the hot zone on bogies. For Part **I** see *Ceram. Abs.*, **21** [1] 12 (1942). V.R.E.

Determination of surface oxidation of bituminous coal. JOHN A. RADSPINNER AND H. C. HOWARD. *Ind. Eng. Chem., Anal. Ed.*, **15** [9] 566–70 (1943).—Methods for determining the extent of surface oxidation of bituminous coals were examined qualitatively, and two, carboxyl group determination and thermal decomposition of surface complex, were examined in detail. The carboxyl group determination, though rather insensitive, can be used to determine the extent of surface oxidation, but examination of the gaseous products obtained by thermal decomposition of oxidized coals was a more sensitive procedure, particularly in the case of high-rank coals. Illustrated. F.G.H.

Efficient operation of heating furnaces. F. A. GRAY, R. J. SARJANT, AND H. H. UTLEY. *Fuel Econ. Rev.*, **21**, 16–39 (1942).—An exposition of furnace practice with special reference to economical operation is presented under the following headings: (1) chief properties and uses of natural and prepared fuels, solid, liquid, and gaseous, (2) relative suitability of fuels, (3) most efficient utilization of available heat, (4) design and function of furnaces, (5) methods of heat transfer, (6) elimination of avoidable heat losses by the use of efficient refractories and insulators and of heat recovery, (7) determination of furnace efficiency, (8) notes on auxiliary equipment, and (9) methods of improving efficiency. V.R.E.

Electrostatic removal of dust from furnace gases. D. D. HOWAT. *Mine & Quarry Eng.*, **7** [3] 59–66 (1942).—After summarizing the development of electrostatic dust precipitation, D. states the principal applications of the process to be (1) removal of dust to improve health conditions and amenities, (2) removal of toxic fumes and recovery of valuable products, and (3) preparation and purification of gaseous materials from blast furnaces, coke ovens, and retorts for use in stoves and blowing engines and for the recovery of tar. The process is particularly suitable for the recovery of particles of less than 15 to 20 microns, and its chief advantages are as follows: (1) Solid and liquid particles are recoverable. (2) Particles from 300 microns down to a fraction of a micron can be recovered. (3) Its efficiency is higher on particles less than 15 microns in size than that of the mechanical type of dust catcher. (4) The dust may be recovered dry. (5) Electrical power consumption is low (less than 15 kw.-hr. per million cubic feet of gas treated). (6) Draft loss is low. (7) Loss of sensible heat is low. (8) Maintenance and repair costs are slight. (9) Variability of efficiency according to commercial conditions is possible. The principle is that when a gas stream with suspended particles passes between an electrode charged to a high potential (usually negative) and one which is grounded, the ions emitted collide with the particles of dust and become attached to them, forming ionized dispersoids which move to the collecting electrode where the particles give up their electric charge and become attached to the electrode until jarred or tapped loose. Collecting electrodes consist either of tubes or plates in batteries and must have a conducting or semiconducting surface; this precludes the use of vitreous enamel. The battery of tubes is built in parallel with the usual inlet and outlet headers. Plate collectors include straight or corrugated plates, rod curtains, and nonmetallic sheets with embedded metallic conductors. The discharge electrode is always fairly fine wire weighted not only to give verticality but also to prevent excessive vibration at high frequency when highly charged. The chief controls are the cleaning of the electrodes and the temperature and moisture content of the gases. V.R.E.

Elementary principles of efficient combustion. F. J. BALL. *Nat. Engr.*, **45** [10] 704–706 (1941).—A knowledge of combustion is necessary for the efficient operation of a steam-generating plant. Turbines, pumps, condensers, and other steam plant auxiliaries are easily kept at their maximum efficiency, but combustion efficiency requires constant vigilance because conditions affecting it are constantly changing. The four essential factors in the burning of fuel are air, temperature, time, and mixture. The time factor relates to the length of time the fuel remains in the furnace, and this also depends upon the speed of the stoker, the length of flame, and the draft of the furnace. Mixture has to do with the intimate combination of air and fuel which is essential for perfect combustion. Photographs. M.R.

Future of natural gas and its derivatives. K. S. ADAMS. *Chem. & Eng. News*, **21** [12] 964–68 (1943).—Illustrated. F.G.H.

Gas-fired industrial furnaces of the war and postwar period. E. G. DE CORIOLIS. Presented at War Conference on Industrial and Commercial Gas, Detroit, Mich., March, 1943. *Heat Treating & Forging*, **29** [5] 233–34, 247–49 (1943).—New processes include "diffusion combustion" and "radiant tube" and are applied to newer types of furnaces such as rotary hearth, controlled atmosphere, and forced convection. Industrial gas is playing a large part in the present war, and it has been calculated that, measured in dollars, the sale of combined furnace equipment in the last two years about equals all cumulative previous furnace business. What will happen to all this equipment when peace comes is unpredictable. Changes will doubtless occur, but unremitting effort combined with research, cooperation, and foresight will still serve as they did in the development of the industrial gas business. M.R.

How to change a downdraft to a horizontal draft kiln. J. D. THOMPSON. *Brick & Clay Record*, **103** [5] 20–21 (1943).—The downdraft kiln is preferred for the uniform heat distribution that may be obtained. Its greatest defect is the high radiation losses, amounting to approximately 50%. Most of these heat losses can be eliminated in a horizontal draft kiln. In changing a downdraft kiln to horizontal draft, (1) the kiln should be raised a foot or more to assist the draft and aid heating near the floor, and (2) the floor should be built solid except for five openings (40 x 6 in.) in the center and insulated, as is also the section behind and between bagwalls and crown. A special type of setting is required, the brick being set in blocks approximately 18 x 18 in., with spaces between blocks for penetration of the horizontal draft. B.C.R.

Improved damper cuts fuel consumption. J. E. O'BREEN. *Nat. Engr.*, **47** [12] 765–66 (1943).—Many economies in the use of fuel have been brought about in England owing to the war. One of these fuel savers is the curtain-type damper which operates on the principle of the common window shade. Construction details of the device and results of operating experience in the field are given. The damper is in use in the U. S. and is marketed under the trade name Heacon. M.R.

Radiant gas burners: use and development in industrial furnace design. F. O. HESS. *Amer. Gas Assn. Monthly*, **24** [5] 180–81, 200 (1942).—H. summarizes experiences in the use of direct radiant gas firing. This new concept of process heating is called "muffleless radiant-cup gas firing." The gas-air mixture burns from a multiplicity of radial slots (in a refractory tip), along and in contact with the surface of a refractory cup designed to follow the natural sweep of the individual flames. The cup surface becomes highly incandescent so that it (1) constitutes an effective radiant energy source of considerable area, (2) accelerates the gas-air reaction so that a high rate of heat is liberated in a small space, and (3) ensures complete combustion of fuel before any gases pass beyond the face of the cup into the work chamber. The application of direct radiant gas firing is discussed in relation to the paint and varnish, ceramic, and metal industries. Photographs. See "Perfect. . .," *Ceram. Abs.*, **21** [4] 88 (1942). M.R.

Recent developments in fuels supply and demand. ARNO C. FIELDNER. *Chem. & Eng. News*, **21** [13] 1067 (1943). F.G.H.

Removal of dust and fumes from furnace gases. D. D. HOWAT. *Mine & Quarry Eng.*, **7** [4] 95–102 (1942).—The chief methods and the minimum size (in microns) of

particles recovered are as follows: (*a*) settling chambers (100 to 200), (*b*) cyclones (100 to 5), (*c*) gas washers (8 to 1), (*d*) filters (0.1), and (*e*) electrical precipitators (0.01 to 0.005). The selection of a method is controlled by particle size, temperature, humidity, load, and nature of the suspension. D. describes cyclones and gas filters briefly with a short reference to gas washers. The mathematical basis of the design of cyclones and their efficiency are discussed with examples, and the nature, application, and operation of fabric filters are described. Because of the poor resistance of fabric to acid and high temperatures, glass-fiber textiles and metal screens have been developed. V.R.E.

Removal of organic sulfur compounds from gases. N. Booth and L. J. Jolley. *Jour. Soc. Chem. Ind.* [London], **62** [6] 87–88 (1943).—Carbon disulfide and carbon oxysulfide possess about the same solubility in water under pressure as CO_2. The total organic sulfur was reduced from 8.2 grains per 100 cu. ft. to 2.7 grains with water under 15 atm., using 0.49 gal. (British) of water per hour. The process would be economical in conjunction with gasification under pressure, now in the experimental stage. L.R.B.

Revolution in industrial heating. F. O. Hess. *Amer. Gas Jour.*, **159** [5] 40–44 (1943).—H. reviews radical changes in industrial heating, including the gas-fired radiant tube. This method of gas-heat application has not only been defensive against the electric furnace and electric heating elements but has eliminated certain harmful chemical and physical effects of the products of combustion on the materials treated. An example of a porcelain kiln for glaze firing is given. Radiant firing appears responsible for successful glaze firing without muffles. G.A.K.

Sensible heat losses in the products of combustion from bituminous coals. Anon. *Fuel Econ. Rev.*, **21**, 57–59 (1942).—Curves showing these losses were given in the first Fuel Economy Monograph, issued in 1921, and were calculated as percentages of the gross calorific value of the coals and correlated with the CO_2 content and the temperature of the gases. The specific heats in these calculations were the then accepted values of Holborn and Austin for O, N, and CO_2 and of Holborn and Henning for water vapor, but new data from spectroscopic characteristics have necessitated the recalculation of the heat losses. The new figures are those of Justi and Lüder (Technical Data on Fuel, 4th ed.) and show considerable increases for CO_2 and N, which together account for 75% of the total heat content. For three typical British bituminous coals the losses were computed from the formula,

$$\text{Sensible heat loss } (\%) = \frac{t - 75}{2.5(C + 0.5)},$$

where t = temperature in °F. and $C = CO_2(\%)$ by volume in the gases. The following table gives the calculated losses expressed as percentages of the gross calorific values, and each figure is the average of three figures obtained for the coals under consideration.

Temp. of gases	CO_2 by volume in dry gas (%)					
	4	6	8	10	12	14
200°C. (392°F.)	28.77	19.52	14.89	12.11	10.31	8.94
300°C. (572°F.)	44.74	30.38	23.18	18.87	16.00	13.96
400°C. (752°F.)	61.10	41.51	31.70	25.81	21.89	19.09

These values can be plotted and give straight-line curves. V.R.E.

Sensible heat losses in combustion products. Anon. *Fuel Econ. Rev.*, **22**, 44 (1943).—Formulas are given for calculating the sensible heat losses in the combustion gases from fuels other than bituminous coals:

$$\text{For coke, } S(\%) = \frac{t - 75}{2.16(C + 0.4)}.$$

$$\text{For petroleum fuel oil, } S(\%) = \frac{t - 70}{2.75(C + 1)}.$$

$$\text{For creosote-pitch mixture, } S(\%) = \frac{t - 72}{2.65(C + 0.6)}.$$

Where S = sensible heat loss, t = temperature of the gases in °F., and C = CO_2 percentage by volume in the dry combustion gases. The heat loss excludes that due to the latent heat of water vapor in the products, and no allowance is made for steam used in the combustion processes, thus excluding the loss resulting from steam used for injecting air or for atomization of liquid fuel. V.R.E.

Spreader-type stokers—what they are—what they do. E. G. Moan. *Nat. Engr.*, **45** [1] 30–34; [3] 182–85; [4] 246–49 (1941).—M. discusses the basic principles, design, operating characteristics, and construction details of some of the leading makes of spreader-type stokers. The first described is the pneumatic spreader-type stoker, the Iron Fireman. Two revolving blade type spreader stokers are the "underthrow" type, viz., the Combustion Engineering Co. and the Hoffman Fire-Rite stokers. The third revolving blade stoker is the "overthrow" type (Detroit Roto-Stoker). Photographs. M.R.

What's happening inside your kiln? XVIII and XIX, Furnace design and stokers. L. R. Whitaker. *Brick & Clay Record*, **103** [4] 20; [5] 17–19 (1943).—For high-temperature kilns, a ratio of grate area to kiln-floor area of 1:4 is recommended, and for the average kiln a ratio of 1:7.5. The size of the furnace depends upon the following factors: (1) maximum temperature to be obtained, (2) firing schedule, (3) maximum amount of fuel to be burned per hour at some period of the schedule, (4) B.t.u. value of coal, (5) size of coal, (6) clinker in coal, (7) draft in kiln, (8) type of ware set in kiln, (9) insulation of kiln, (10) skill of firemen, (11) price of fuel, (12) method of firing, and (13) the material. **XX, Stokers.** *Ibid.*, [6] 19–20.—The construction of a wood-burning furnace is described. The expense of stoker installation must be justified by (1) reduced cost of firing the ware and/or (2) improved quality of the fired ware. One of the outstanding results of stoker-fired kilns is the better quality of the ware (greater uniformity in size and color) due to a harder firing; the higher firing temperature is made possible through better control of firing by the use of stokers. The motion of the feed screw should be continuous to avoid jamming of the feed screw tube and segregation of coal in the flights of the auger. One cause of failure to lower fuel consumption was the inability of the stoker to furnish sufficient coal to raise the temperature of the kiln during the period of raising heat. For Parts **XV–XVII** see *Ceram. Abs.*, **23** [1] 21 (1944). B.C.R.

Geology

Chromite in India. A. L. Coulson. *Bull. Econ. Min., Geol. Survey India;* abstracted in *Mining Jour.* [London], **214** [5530] 389 (1941). V.R.E.

Clays and soils in relation to geologic processes. C. S. Ross. *Jour. Wash. Acad. Sci.*, **33** [8] 225–35 (1943).—R. reviews the present knowledge of clay mineralogy and the crystal-chemical properties of the various clay-mineral families: kaolinite, montmorillonite, and bravaisite (elsewhere called illite). The problems of the relationship of the parent rock to the resultant soil under various conditions of weathering are outlined. Our knowledge of the properties of the clay families is of considerable assistance in approaching the problem of rock decomposition. Depending on conditions, a granitic rock may yield any one of the clay minerals, but the clay mineral resulting from the decomposition of a basic rock is somewhat restricted in composition. S.Z.

Crude silica-sand output doubled to meet war demands of foundries. H. F. Utley. *Pit & Quarry*, **35** [2] 41–43 (1942).—Outcrops of St. Peter's sandstone in the vicinity of Ottawa, Ill., provide the finest quality of silica sand obtainable anywhere. It is practically pure sand, the

deleterious material being a small percentage of clay. The producing companies in the area turn out crude sand, washed and dried, and ground sands or both. U. deals only with the crude-sand phase of the operations and specifically those carried out by the American Silica Sand Co., probably the largest exclusive producer of crude silica sand in the U. S. The company operates 3 pits and plants from which nearly 1,000,000 tons of crude sand are produced annually. The equipment of the Ottawa pit is described, with photographs of some of the equipment. M.R.

Five companies working new bauxite reserves. ANON. *Pit & Quarry*, **36** [6] 69 (1943).—New bauxite reserves discovered by the Bureau of Mines in Alabama are being commercially developed. Five private companies are working eight of the deposits. These deposits contained a total of 179,000 tons of marketable-grade material, and 40,300 tons of bauxite have been shipped. The new reserves are situated in 33 deposits and it is estimated that 1,680,000 tons of bauxitic material are available. This amount includes 352,800 tons of commercial-grade bauxite. M.R.

Flotation plant in Florida recovers phosphate from accumulated tailings. ANON. *Pit & Quarry*, **35** [11] 59–62 (1943).—The Phosphate Mining Co., organized in 1905 as a producer of phosphate rock from the land-pebble phosphate field of Florida, has been one of the leading producers and processors of pebble phosphate since that time. In January, 1941, the company built a froth-flotation and table concentration plant at Phosmico, 5 miles northeast of Bartow, Fla. The new plant has a monthly capacity of 15,000 tons of flotation concentrates and recovers phosphate from millions of tons of debris which has been wasted since 1929 by a washing plant. The procedure and the equipment of the new plant are described. A drying plant makes this a complete phosphate-recovery and processing operation at one location. Photographs. M.R.

Fluorspar. F. B. MITCHELL. *Mine & Quarry Eng.*, **7** [6] 143–47 (1942).—M. describes the occurrence and dressing of fluorspar in Great Britain and discusses its uses. V.R.E.

Kaolin deposits to be worked in Indiana. ANON. *Pit & Quarry*, **35** [5] 72 (1942).—Tests of halloysite samples from Indiana deposits reveal that the clay is of the best quality. The kaolin was found to contain 40% alumina. If the deposits contain as much as 3,000,000 tons, production equipment will be set up. Chemical companies hope that the deposit may include 20,000,000 tons. M.R.

Land-pebble phosphate deposits of Florida: IV. W. H. TAYLOR. *Pit & Quarry*, **35** [5] 61–65 (1942).—Of the 4,920,843 long tons of phosphate rock mined in the U. S. in 1941, the Florida land-pebble district alone produced 3,279,706 tons or nearly 70% of the total. Much of this is transported by rail, both to customers of the finished product and in interplant movement of the semifinished product. Box cars are used to some extent, but loading and unloading of steel bottom-dump cars are much faster. Some Florida companies have water facilities which permit loading fairly large ships. Mention is also made of the many applications of conveyers, elevators, and other materials-handling equipment. T. discusses the research and chemical organizations maintained by the companies for the development of new methods and the daily analyses of all the rock mined, dried, and shipped. Illustrated. M.R.

Leading producer of industrial sand adds plant at deposit in New Jersey. W. E. TRAUFFER. *Pit & Quarry*, **35** [3] 58–61, 63 (1942).—The Whitehead Brothers Co., New York, put in operation at Dividing Creek, N. J., a new plant which sets a standard for the industry. The output of the numerous plants which the company operates is chiefly foundry sand, with a few types of other industrial sands. The deposit at Dividing Creek is pure white silica with a uniform grain size and almost entirely devoid of gravel. A description is given of Plants No. 1 and No. 2, which includes stripping, centrifugal dredges, and a drying plant. Photographs. M.R.

Limestone and lime in the chemical pulp industry. A. M. CADIGAN. *Pit & Quarry*, **35** [5] 74–76, 78 (1942).—In the manufacture of all grades of chemical wood pulps, lime or its parent compound, limestone, plays an essential role. Lime is used not because it is the most desirable chemical but often because it is the most economical. In addition to the fact that less lime than caustic soda and soda ash are needed, the costs of the three materials are $12, $40, and $20 per ton, respectively. The limited solubility of many of its compounds detracts from lime's desirability in some instances, but in others that limited solubility is an advantage. All lime used in making chemical pulp could be covered by one specification with one exception, dolomitic lime used in the milk of lime process of making "sulfite" acid. C. discusses lime in general and in particular as it affects the manufacture of sulfite, soda, and sulfate (Kraft) pulps and the bleaching of pulps. M.R.

Minerals for the paint industry. S. J. JOHNSTONE. *Jour. Oil & Colour Chemists' Assn.*; abstracted in *Mining Jour.*, **217** [5567] 183 (1942).—J. discusses (1) metals: lead, zinc, antimony, cadmium, chromium, cobalt, selenium, titanium, manganese, radium, and mesothorium; and (2) minerals: china clay, diatomite, barytes, gypsum, celestite, and ochers. V.R.E.

New Mexico pumice plant built up to efficiency by trial and improvement. W. E. TRAUFFER. *Pit & Quarry*, **35** [12] 65–67 (1943).—Manufacturers no longer have to depend on imports for high-grade pumice. Domestic pumice and pumicite production amounted to nearly 90,000 tons in 1939. One of the most important American producers is the Pumice Corp. of America, which operates a plant near Grants, N. Mex. The plant was acquired by the Pumice Corp. in 1941 and has a capacity of about 5 tons per hour. T. describes the deposit and discusses plant processes and equipment. Photographs. M.R.

Pottery made successfully with Paricutin's lava. ANON. *Science News Letter*, **44** [20] 312 (1943).—Mexico's volcano may be producing raw material for a new Mexican ceramics industry. The pottery factory of the Anfora Co. has just completed successful experiments with four tons of lava which prove that it can be used in making pottery. G.A.K.

Relative abundance of the isotopes of potassium in Pacific kelps and in rocks of different geologic age. K. L. COOK. *Phys. Rev.*, **64** [9–10] 278–93 (1943).—The Dempster double-focusing mass spectrograph has been used to determine the K^{39}/K^{41} isotope ratio in certain Pacific kelps, fossils, and rocks of different geologic age. Within the 1% accuracy obtainable, the potassium isotope ratio for the kelps and two Upper-Cambrian fossils examined is the same as that of rocks. Rocks whose ages vary from Early pre-Cambrian to Tertiary show no measurable difference in the potassium isotope ratio, within 1% error. The average value of the potassium isotope ratio was found to be 14.12 ± 0.28. Fluctuations in the ratio are attributed to isotope effects of the hot-filament ion source. G.A.K.

Schundler expands bentonite-milling capacity at deposits in Black Hills. ANON. *Pit & Quarry*, **35** [9] 75–76 (1943).—The plant and processes of the F. E. Schundler Bentonite Co., Inc., whose deposits are located near Belle Fourche, S. D., are described. The plant capacity is about 115 tons per 24-hr. day, and its entire production goes to the foundry industry. In normal times much of the plant's output goes to other fields, including the ceramic industry, where it is used as an ingredient in many types of ceramic bodies. Photographs. M.R.

Wolfram in Nigeria: with notes on cassiterite, wolfram, and columbite zones. H. L. HAAG. *Bull. Inst. Mining & Met.*, No. 458, pp. 1–34 (1943).—Alluvial wolfram is occasionally found associated with tin and occasionally in lodes, but all the deposits are small and scattered. Lack of water is the chief operating difficulty, but the deposits can be profitably worked when the price of wolfram is at least 75s per unit of WO_3. V.R.E.

Zirconium—an abundant "rare" metal. W. M. RAYNOR. *Foote-Prints*, **15** [2] 3–10 (1943).—R. describes the

history of the development of zirconium-metal powder and ductile zirconium, their uses as "gas sponges" (getters) in vacuum tubes, and the possibilities of zirconium in photoflash bulbs, as a corrosion resistant, and in metallurgy. A.P.

SEPARATE PUBLICATION

Geology of Alberta. JOHN A. ALLAN. *Research Council of Alberta* [Can.], *Rept.* No. 34, 196 pp. (1943). 12 maps, 74 photos. Price, paper, $1.50.—This excellent report comprises (1) general geology, (2) rock salt deposit at Waterways, (3) geology of Alberta soils, (4) relief model of Alberta and its geological applications, and (5) coal areas of Alberta. G.M.H.

PATENTS

Glass sand purifying process. F. X. TARTARON AND J. B. DUKE (Minerals Separation North American Corp.). Can. 417,059, Dec. 14, 1943 (May 20, 1942; in U. S. July 11, 1941). G.M.H.

Kyanite concentration. N. K. KARCHMER AND C. E. HEINRICHS (Minerals Separation North American Corp.). Can. 417,056, Dec. 14, 1943 (March 31, 1941; in U. S. Aug. 1, 1940). F. X. TARTARON (Minerals Separation North American Corp.). Can. 417,057, Dec. 14, 1943 (Sept. 2, 1941; in U. S. April 9, 1941). G.M.H.

Modified clay. B. W. ROWLAND (Edgar Bros. Co.). Can. 417,250, Dec. 21, 1943 (Dec. 15, 1938). G.M.H.

Phosphate-mineral concentration. ARTHUR CRAGO (Minerals Separation North American Corp.). Can. 416,172, Nov. 2, 1943 (Sept. 5, 1941; in U. S. Oct. 8, 1940). G.M.H.

Titanium-bearing material chlorination. ALPHONSE PECHUKAS (Pittsburgh Plate Glass Co.). Can. 416,022, Oct. 26, 1943 (Feb. 25, 1941). I. E. MUSKAT AND R. H. TAYLOR (Pittsburgh Plate Glass Co.). Can. 416,023, Oct. 26, 1943 (Feb. 25, 1941). G.M.H.

Chemistry and Physics

Applications of physics in chemical industry. A. J. MEE. *Jour. Sci. Instruments*, **20** [9] 137–41 (1943).—M. discusses a few of the more interesting advances recently made in the applications of physics to the chemical industry. The following applications are reviewed: (1) viscosity, (2) refractive index, (3) hydrogen-ion concentration control, (4) electrometric analysis, (5) the polarigraph, (6) spectrographic analysis, (7) photocells, (8) X rays, (9) the electron microscope, and (10) ultrasonics. Advance in the last ten years has been mainly in the simplification of instruments so that they can be used by unskilled or semiskilled operators. G.A.K.

Contact angles. E. J. IRONS. *Phil. Mag.*, **34** [236] 614–24 (1943).—A detailed development of the theory of the capillary-tube method for the determination of the contact angle between a liquid and a solid is given. Data for angles measured for six different liquids against various metals and glass are listed. Cosines of the angles are essentially unity. S.Z.

Coprecipitation of chromate with barium sulfate. WILLIAM B. MELDRUM, WILLIAM E. CADBURY, JR., AND CLARK E. BRICKER. *Ind. Eng. Chem., Anal. Ed.*, **15** [9] 560–62 (1943).—The coprecipitation of chromate with barium sulfate has been studied quantitatively under carefully controlled conditions. Acidity, rate of precipitation, ratio of chromate to sulfate, and time of digestion were varied in turn. The results obtained support the view that for the most part the chromate coprecipitated is probably in the form of barium chromate in mixed crystals with barium sulfate. Illustrated. F.G.H.

Course of instruction in micromeritics. J. M. DALLA-VALLE. *Jour. Chem. Education*, **20** [11] 557–61 (1943).—D. has outlined a course for junior or senior chemists and other technical students embracing the subject matter of the behavior and physical properties of small particles. Justification for the course is offered by discussion of the application of the science to various fields. The subject matter and time requirements of the outlined course are listed. See "Micromeritics . . .," *Ceram. Abs.*, **22** [6] 106 (1943). S.Z.

Demineralizing industrial water and process liquors. ESKEL NORDELL. *Chem. & Met. Eng.*, **50** [10] 112–15 (1943).—Raw water at ordinary temperatures is passed first through a hydrogen cation exchanger and then through an anion exchanger or acid absorbent. The net result is an effluent comparing favorably in quality with distilled water. Operating costs range from 3 to 16¢ per 1000 gal. B.C.R.

Determination of copper volumetrically by the iodine-thiocyanate method. C. C. OGLETHORPE AND C. G. SMITH. *Analyst*, **68** [812] 325–28 (1943).—In determining copper volumetrically by the liberation of iodine in the presence of KSCN, low and often variable results were obtained, especially if the KSCN was added before the iodide, owing to the decomposition of cupric thiocyanate as soon as it is formed. This difficulty can be overcome without the use of any considerable quantity of KI by titrating with a small quantity of iodide present and completing the titration after the addition of a slight excess of either K or NH_4 thiocyanate. The presence of small amounts of acid in the copper solution did not affect the results adversely. B.C.R.

Determination of small quantities of sodium in soil solutions and soil extracts. M. Y. SHAWARBI AND A. G. POLLARD. *Jour. Soc. Chem. Ind.* [London], **62** [5] 71–73 (1943).—Some modifications of Woelfel's method for the determination of small quantities of sodium (5 to 500 p.p.m.) by manganous uranyl acetate are described. The permanganate color developed was estimated with a Lovibond-Schofield tintometer. L.R.B.

Determination of tin with mercuric chloride. J. G. FAIRCHILD. *Ind. Eng. Chem., Anal. Ed.*, **15** [10] 625–26 (1943).—Tin can be determined by weighing the mercurous chloride formed on adding stannous chloride to mercuric chloride. With pure tin solutions, the procedure is rapid and accurate and is applicable over a range of 0.1 to over 70% tin. F. describes the necessary procedures as applied to concentrates, cassiterite ores, and ores containing complex tin sulfides. It is especially suited for tin in low-grade ore. F.G.H.

Dithizone method for the rapid determination of copper. G. H. BENDIX AND DORIS GRABENSTETTER. *Ind. Eng. Chem., Anal. Ed.*, **15** [10] 649–52 (1943).—A method is described for the rapid colorimetric estimation of copper with dithizone. Interference from all metallic ions except platinum, palladium, gold, silver, mercury, bismuth, and stannous tin is eliminated by extracting the copper as the dithizonate complex from an aqueous solution at pH 2.3. The reaction products of silver, gold, mercury, bismuth, and stannous tin with dithizone are destroyed by shaking the extract with acidic potassium iodide solution. Recoveries of better than ±0.3 microgram were obtained. Illustrated. F.G.H.

Graphic representation of the qualitative scheme of chemical analysis for the more common anions. D. BRAWLEY. *Jour. Chem. Education*, **20** [10] 502–505 (1943).—Two large (2-page) diagrams are presented showing graphically, in detail, the procedure for complete separation and identification of the common cations and anions. S.Z.

Mass spectrometer as an analytical tool. H. W. WASHBURN, H. F. WILEY, AND S. M. ROCK. *Ind. Eng. Chem., Anal. Ed.*, **15** [9] 541–47 (1943).—Discussing the mass spectrometer as an analytical tool, the authors describe the method of analysis, present results obtained with this method, and give information regarding the commercial instrument that is now in use. Illustrated. F.G.H.

Phase diagrams and the mass law. T. R. BRAGG. *Jour. Chem. Education*, **20** [10] 484–87 (1943).—The calculation of a *P-T-X* diagram is demonstrated for the case

of the compounds NH_4Cl and ammonium carbamate. Results are compared with laboratory data obtained by B. S.Z.

Properties of fluids. S. C. BRADFORD. *Phil. Mag.*, **34** [234] 433–71 (1943).—A general theory of fluids, based on molecular attraction, in which all of the properties can be calculated by means of Newton's dynamics and Edser's inverse eighth-power law of molecular attraction, is presented in detail. The theory is derived without recourse to any arbitrary assumptions. Agreement of calculated and observed data is offered in support of the theory. The various general properties of fluids are discussed, and data are compared. S.Z.

Radiation, light, and color. H. H. EMSLEY. *Optician*, **104**, 393, 409; **105**, 6, 21, 71, 88, 117, 118, 135, 151, 180, 197, 229, 245, 275, 309, 323; **106**, 67, 83 (1943).—E. presents an elementary description of the physics of the radiation of light. A.P.

Rapid method of dialysis. R. C. ROSE. *Jour. Soc. Chem. Ind.* [London], **62** [3] 44 (1943).—Turbidity (such as is produced by soils and clays) may be removed by what amounts to dialysis: 20 ml. of 2% sodium alginate (Manucol I) are added to 100 ml. of the turbid solution, stirred, and poured into 20 ml. of 5% calcium chloride solution. The gel contracts, carrying the turbidity and leaving a solution suitable for pH determination if the sodium alginate and calcium chloride were first made neutral. L.R.B.

Separation and determination of very small amounts of aluminum and iron in water. N. STRAFFORD AND P. F. WYATT. *Analyst*, **68** [812] 319–24 (1943).—Methods of determining aluminum in concentrations of 0.1 to 0.5 p.p.m. are described. B.C.R.

Systematic polarigraphic metal analysis. Characteristics of arsenic, antimony, bismuth, tin, lead, cadmium, zinc, and copper in various supporting electrolytes. JAMES J. LINGANE. *Ind. Eng. Chem., Anal. Ed.*, **15** [9] 583-90 (1943).—The polarigraphic characteristics in nine supporting electrolytes of the metals listed in the title were studied, and complete data are presented for their half-wave potentials and diffusion-current constants. The utility of diffusion-current constants in practical analytical work is discussed; the use of these constants eliminates the need for calibrating each particular dropping electrode with known concentrations of the substances to be determined. Illustrated. F.G.H.

Three types of energy of viscosity. A. E. DUNSTAN AND A. H. NISSAN. *Phil. Mag.*, **34** [234] 479–86 (1943).—For narrow ranges of temperature, the viscosity-temperature relationship of unassociated liquids is best represented by the equation $\ln \eta = A' + B/T$ in which η is the viscosity in absolute units, T is the absolute temperature, and A' and B are constants. The constant A' is essentially invariant with temperature, but the constant B varies with temperature in an interesting manner. B is related to the viscosity energy of activation: $B = Q/R$ in which equation Q is the energy of activation of the process and R is the gas constant. B is also related to the energy of vaporization. When the value of Q, as it varies with temperature, is properly analyzed, it is found to be the resultant of several energy terms. With Q are associated two types of energy of viscosity probably resulting from variations among the molecular force fields. Analyses of equations and of the three energy types are given. S.Z.

BOOKS

Chemical Formulary: Vol. VI. H. BENNETT. Chemical Publishing Co., Inc., New York, 1943. 635 pp. Price $6.00. Reviewed in *Chem. Industries*, **53** [5] 730 (1943).—Additional new formulas are given, bringing up to date the contents of the five previous books. A chapter on substitutes for scarce materials is also included. E.D.M.

Chemical Spectroscopy. WALLACE R. BRODE. John Wiley & Sons, Inc., New York, 1943. 2d ed. 677 pp. Price $6.50. Reviewed in *Chem. Industries*, **53** [5] 730 (1943).—This book is intended as a text for a course in advanced chemical spectroscopy and a reference book for workers in the field. About half the book is devoted to a description of spectrographic apparatus and its use in qualitative and quantitative analysis. Various tables are included. The book is profusely illustrated with both photographs and line drawings. A complete and well-chosen bibliography of the entire field of spectroscopy is included. E.D.M.

PATENTS

Ceramic. H. S. COOPER (Cooper-Wilford Beryllium, Ltd.). U. S. 2,337,521, Dec. 21, 1943 (Nov. 28, 1940).—A composition of matter comprising a fused mixture of beryl and calcium fluoride.

Manufacture and use of fluorescent materials. H. S. TASKER (Ilford, Ltd.). U. S. 2,336,815, Dec. 14, 1943 (Feb. 17, 1941).—Fluorescent barium sulfate material consisting essentially of substantially pure crystalline barium sulfate having an intensification factor of at least 12 and obtainable by heating substantially pure crystalline barium sulfate at a temperature of 900° to 1150°C. for a period of at least 1 hr.

Preparation of carbonate salts of calcium and magnesium. WALTER MCGEORGE AND F. H. MILNER. Can. 416,065, Nov. 2, 1943 (July 22, 1940). G.M.H.

Titanium dioxide pigment. I. E. WEBER AND A. N. C. BENNETT. Can. 416,513, Nov. 23, 1943 (May 13, 1940). G.M.H.

Titanium oxide composition. R. R. RIDGWAY (Norton Co.). Can. 416,316, Nov. 9, 1943 (May 18, 1940; in U. S May 24, 1939). G.M.H.

Titanium pigment manufacture. S. P. TODD AND F. C. VERDUIN (Sherwin-Williams Co.). Can. 416,028, Oct. 26, 1943 (Feb. 15, 1941; in U. S. March 2, 1940). G.M.H.

Vanadic oxide flake manufacture. BLAIR BURWELL (U. S. Vanadium Corp.). Can. 416,499, Nov. 16, 1943 (March 18, 1941). G.M.H.

Zirconium nitrate. D. S. HAKE (deceased) AND C. J. KINZIE (Titanium Alloy Mfg. Co.). Can. 416,036, Oct. 26, 1943 (Feb. 19, 1942). G.M.H.

General

Air-borne enemies. W. E. MCCORMICK. *Safety Eng.*, **86** [5] 51–55 (1943).—The hazard to health produced by the inhalation of certain dusts has been realized most fully by industry during the past decade. In the ceramic industry it is of special importance that those health hazards be recognized and combated. In the pottery, refractory, and porcelain industries the worker is frequently exposed to high concentrations of silica or certain toxic dusts. McC. discusses the fibrosis-producing type of dust, which includes silica, and the toxic type (lead, zinc, etc.), as it is from these two types that the majority of industrial dust hazards arise. The amount and kind of dust must be known; for this purpose dust samplers are available. The size of dust particles is important, as in silicosis it has been determined that the smallest particles are the most active. Good housekeeping in the industrial plant, adequate ventilation, and protection of the individual workers are the general rules covering dust control. See "Dust hazards. . .," *Ceram. Abs.*, **21** [1] 28 (1942). M.R.

Are your wage rates too low to make money for you? ANON. *Ceram. Ind.*, **41** [3] 31–32 (1943).—A piecework plan is described which puts the individual worker in business for himself. H.T.

George Estes Barton. JAMES G. VAIL. *Bull. Amer. Ceram. Soc.*, **23** [1] 1–4 (1944).—1 reference, 3 photos.

Bulk packaging of chemicals. ANON. *Chem. & Met. Eng.*, **50** [10] 117–24 (1943).—Wartime conditions have resulted in the use of multiwall paper bags for packaging materials formerly shipped in metal, glass, or wooden containers. The fundamental advantages and economics of

the versatile multiwall paper bag for many solid products have accelerated a trend that may become very important in postwar packaging. B.C.R.

Campaign on rope conservation gets under way. ANON. *Ind. Marketing*, **28** [13] 62, 64 (1943).—The rope conservation campaign conducted under the auspices of the War Production Board with the cooperation of cordage manufacturers and the National Industrial Advertisers Assn. is designed to instruct users in the efficient use and care of rope. Promotional material to be used is described. M.R.

Cause and prevention of motor failures. ANON. *Nat. Engr.*, **45** [3] 177 (1941).—Most motor failures are due to two causes, single phasing and worn or hot bearings which cause the rotor to rub the stator. Causes of these two types of failures and appropriate remedies are suggested. M.R.

Chain systems in rotary kilns. R. SALMONSEN. *Pit & Quarry*, **36** [6] 61–62 (1943).—A substantial fuel saving may be brought about in wet-process rotary kilns by reducing the stack-gas temperature. This may be done by installing a system of chains in the feed end of the kilns. Such a system has been patented by F. L. Smidth & Co., and a typical installation is described. The distorted chain links, draft controls, and other features are discussed. Illustrated. M.R.

First month hardest on newly employed women in ceramic plants. ERNEST A. DENCH. *Better Enameling*, **14** [10] 14, 22 (1943).—British experience has shown that the first month is the most difficult. A novice should not be permitted to work overtime during the first month, lest excessive fatigue occur; consequently, want ads should not mention overtime pay but only the average pay received for normal hours worked. Plant rules, except safety-first rules, should be modified during the first month, and fines should not be assessed for their infractions. Women should not be expected to equal men in heavy tasks. Length of travel to and from work should be considered in arranging working shifts; women are sometimes released 5 to 15 min. early to avoid congested transportation facilities. Plant cafeteria defects should be improved. Women employees who quit due to domestic emergencies should be encouraged to return at the end of such emergency if they show promise of developing into steady workers. B.C.R.

Getting the most from your conveyer belting and other rubber equipment. W. D. BRADSHAW. *Pit & Quarry*, **35** [4] 48–50 (1942).—B. offers suggestions which will help to lengthen the life of sand suction hose, rubber pump lines, dredge sleeves, pressure hose, and transmission and conveyer belts. Diagrams. M.R.

Industrial eye-health problems. HEDWIG S. KUHN. *Amer. Jour. Pub. Health*, **33** [9] 1103–1106 (1943).—In many industries where visual admission standards have been set up, a single arbitrary specification has been used, based only on central visual acuity for distance. Instead, the eyes should be recognized as a binocular unit with multiple functions, each of which has a definite bearing upon the individual's ability to meet the demands of a specific job. Cooperation between management and employee is required in determining the relative costs assessed when the lens prescription is incorporated in goggles to correct refractive errors. Accuracy and efficiency of work are found to be closely correlated with perfection of visual performance. Results of surveys point to a direct and consistent relationship between maximum production and accuracy and the visual perception components. See "Appraisal. . .," *Ceram. Abs.*, **20** [11] 275 (1941). B.C.R.

Machine guards, some principles and applications. ANON. *Nat. Safety News*, **47** [3] 90, 121–23 (1943).—Mechanical guarding is extremely important and is now covered by strict laws in most states. Guards can best be designed by machinery manufacturers and should be covered by specifications when purchasing. Points of hazard in machine operation may be classed in two main groups, (1) points of operation and (2) transmissions and other moving parts not at the point of operation. Hazards may be eliminated by (*a*) mechanical feeding and ejecting devices, (*b*) two-hand control devices, (*c*) redesign of machine parts to prevent the operator from getting into the danger zone, (*d*) devices to stop the machine when any part of the operator is in the danger zone, (*e*) devices that push or pull the operator's hands away from the danger zone, (*f*) barricades, covers, hood guards, and other enclosures, and (*g*) interlocking devices. Data for guards under consideration are given in tables. Operators may be further protected by (1) automatic lubrication or extension of oiling devices through guards, (2) mechanical handling of materials at the machine, (3) reduction of noise and vibration, (4) adequate lighting, (5) light-colored paint on machines, (6) exhaust systems to remove dust, fumes, etc., (7) elimination of sharp corners and projections from machines, (8) safety clothing, and (9) personal protective equipment. M.R.

Organization of American scientists for the war. K. T. COMPTON. *Proc. Roy. Soc.* [London], **A182**, 1–17 (1943). A.P.

Philosophy for chemical progress. ALFRED H. WHITE. *Chem. Industries*, **53** [5] 653–55 (1943).—The growth of chemistry and the chemical industry and of the chemical and chemical engineering professions over the past 50 years is reviewed. From a scientific standpoint the expansion of the chemical industry has been due to two major new influences: (1) the development of science to the place where the chemist, the physicist, and the chemical engineer have been able to work effectively, and (2) the recognition by management that this scientific knowledge should govern plant operation and that empiricism and traditionalism should be discarded for the newer and firmer basis. To ensure continued progress there must be cooperation in research and in interchanging knowledge, the dissemination of which will be for the common good. There must be adequate reward for initiative for both the individual and the corporation. E.D.M.

Place of pottery and glassware in America's postwar program. E. J. DETGEN. *Domestic Commerce*, Sept., 1943; reprinted in *Glass Ind.*, **24** [9] 378–79, 397, 399 (1943); *Ceram. Ind.*, **41** [3] 25–27 (1943).—It is estimated that the postwar sales of table and kitchen pottery and glassware products may reach a total of $313,000,000 annually. This amount will be supplied from imports as well as from domestic sources. H.T. & A.P.

George D. Roper Corporation presents its postwar plan. E. L. HOLLINGSWORTH. *Ceram. Ind.*, **41** [4] 35–36 (1943). H.T.

Symposium on technical library techniques: (1) Library versus laboratory research. A. G. CONNOLLY. *Jour. Chem. Education*, **20** [11] 531–33 (1943).—The interdependence of library and laboratory research is discussed with emphasis on the importance of comprehensive library searches. (2) **Publications: pitfalls and problems.** M. G. MELLON. *Ibid.*, pp. 534–37.—The pitfalls of technical publications are errors, inaccuracy, obscurity, and indexing. The various problems of this type of publication are discussed briefly. (3) **Abstracting and indexing.** E. J. CRANE. *Ibid.*, pp. 537–39.—The editor of *Chemical Abstracts* presents a few notes on the technique of abstracting and indexing the technical literature. (4) **Preparation of a manuscript for publication.** J. SASSO. *Ibid.*, pp. 540–41. (5) **Keeping up with technical books.** E. PORTMAN. *Ibid.*, pp. 542–44. (6) **Operating a technical library under a library committee.** C. W. FOOTE. *Ibid.*, pp. 544–45. (7) **"Slips that pass in the night." A plea for accuracy in printed material.** E. H. MCCLELLAND. *Ibid.*, pp. 546–47.—Typical errors in grammar and rhetoric are illustrated by examples from the popular and technical press. McC. lists and discusses three factors believed to contribute to the impairment of English speech: improper hyphenation, acceptance of new terms without due consideration, and avoidance of the use of prepositions and conjunctions. Numerous examples are given. S.Z.

You and tomorrow and ceramics. HARDY L. WINBURN. *Jour. Arkansas Education*, Nov., 1943; reprinted in *Bull. Amer. Ceram. Soc.*, **23** [1] 5–6 (1944).

MAR 25 1944

CERAMIC ABSTRACTS and THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

MARCH 15, 1944

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES

FORTY-SIXTH ANNUAL MEETING PROGRAM

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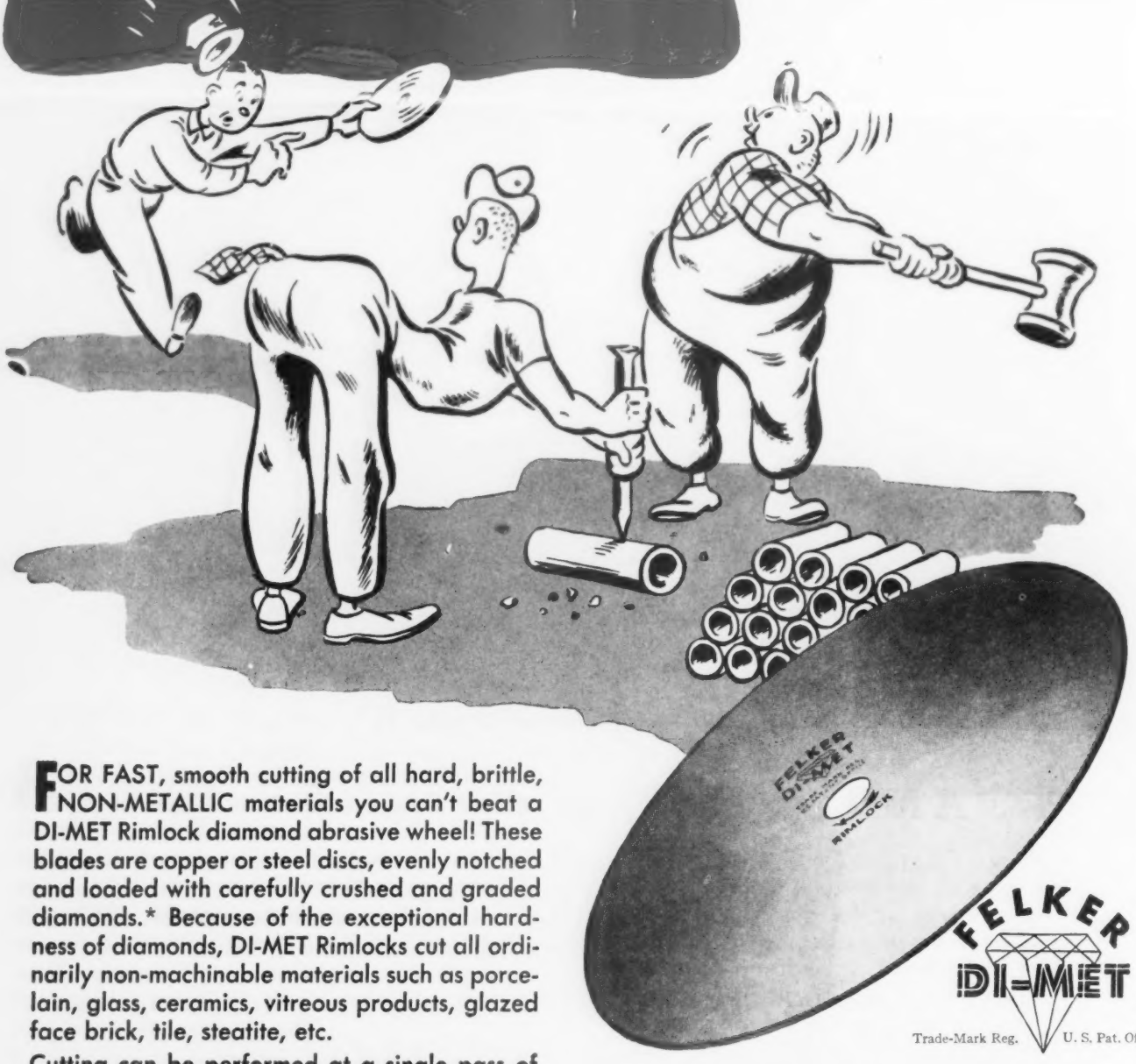

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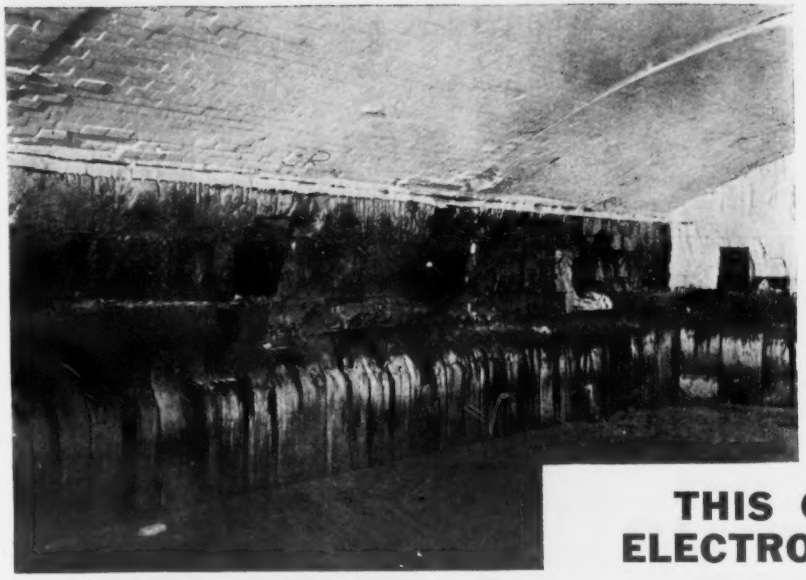

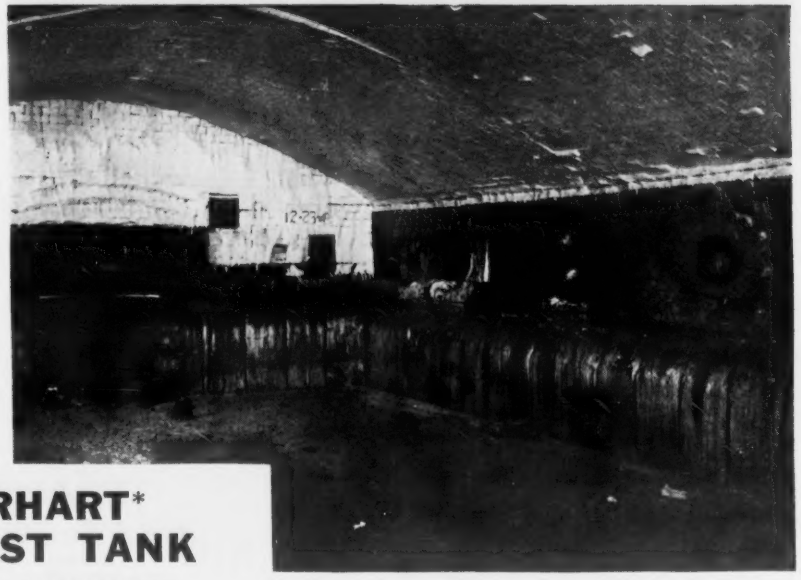

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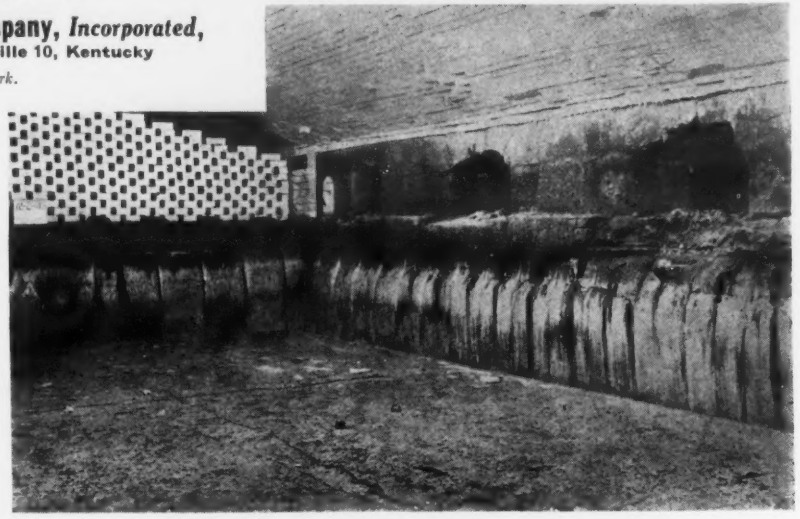
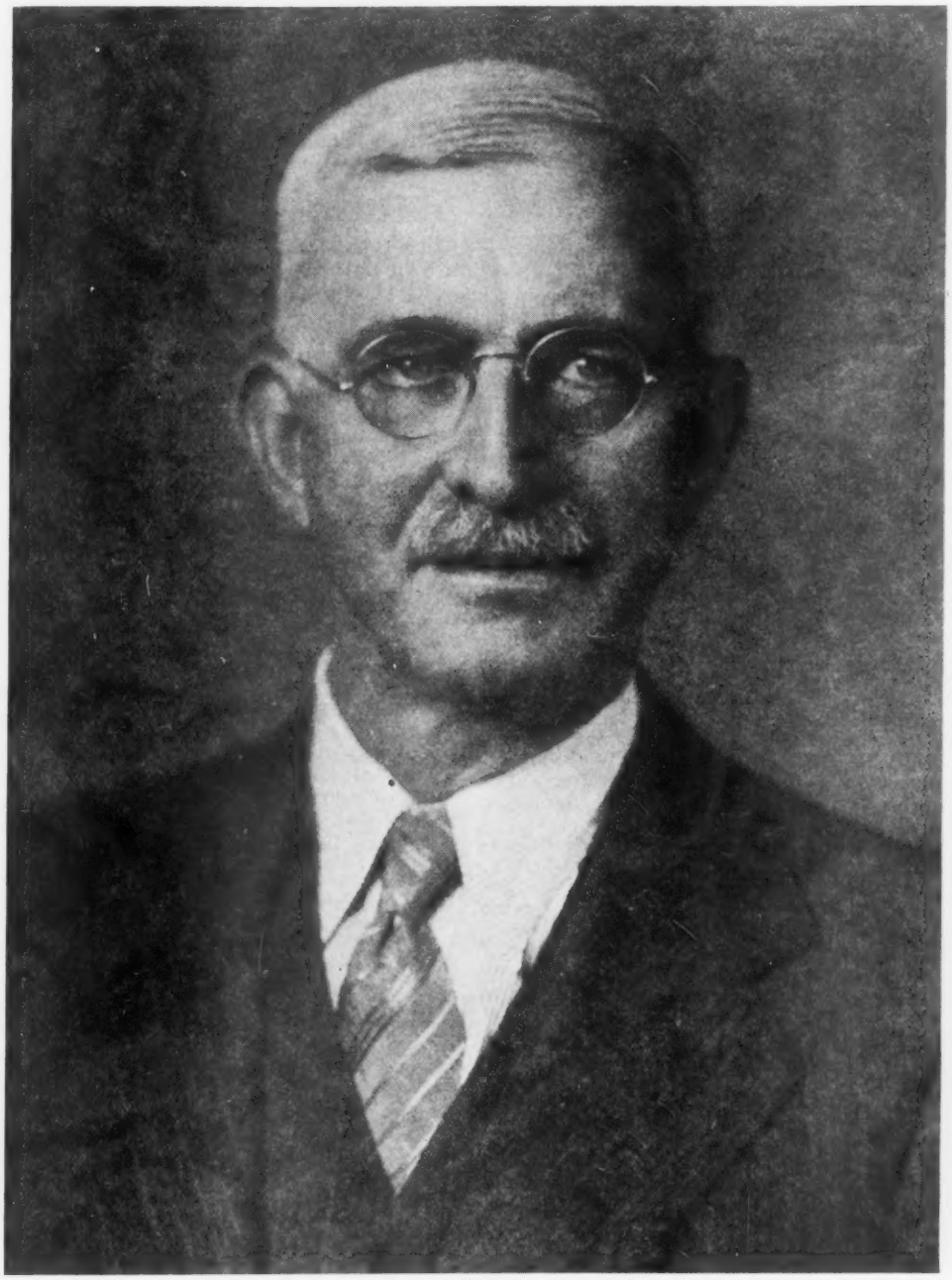


THE BULLETIN SECTION

Volume 23 February 15, 1944 Number 2



RAY THOMAS STULL

RAY THOMAS STULL

Ray Thomas Stull was a member of this Society for forty years and served as its President in 1919. He was the twenty-first President.

Ray Stull passed away on January 5, 1944. He had left home apparently in good health, and shortly after arrival at his office in the National Bureau of Standards suffered a stroke from which he died almost immediately.

Ray Stull made a very decided imprint in ceramics which will, for all time, be recorded in the ceramic history, through services rendered at the University of Illinois, in the Bureau of Mines, and in the National Bureau of Standards.

The most striking memorial to Ray Stull is the magnificent Ceramics Building at the University of Illinois. In 1940, *The Illini Ceramist* was dedicated to Ray Stull with the following dedication remarks:

*"We are honored in dedicating this issue of the Illini Ceramist to Mr. Ray T. Stull—an active leader of ceramic research—most instrumental in securing the erection of the building in which we are now located."**

From the Keystone State

Ray Stull was born in Elkland, Pa., March 12, 1875. He was graduated from the grade and high schools at Elkland, and then spent one year in college preparatory at the State Normal School at Mansfield, Pa. He was graduated from Ohio State University in 1902 with the degree of E.M. Cer. While at the University of Illinois, he earned five hours of credit in postgraduate work in mineralogy.

The high character of his work in college earned for him the honor of election to membership in the Society of Sigma Xi. He was also made an honorary member of Alpha Chi Sigma, Keramos, and the Illinois Clay Manufacturers Association.

He was a Charter Member of the Fellows of The American Ceramic Society and a member of the Founders' Group of the Institute of Ceramic Engineers. His Division affiliations were Structural Clay Products and Terra Cotta. He served as Vice-President in 1915, as President in 1919, and as Trustee in 1920–1921.

Professional Activities

For two years (1902–1904), he was chemist for the American Terra Cotta & Ceramic Co., Chicago, Ill. The following two years (1905–1907), he served as superintendent of the Mt. Savage Enamel Brick Works at Mt. Savage, Md., and for six months he was superintendent of the Steiger Terra Cotta & Pottery Co., San Francisco, Calif.

He was invited to become an instructor at the University of Illinois in 1907. On the retirement of Albert V. Bleininger, Mr. Stull became the acting head of the Department of Ceramics at the University of Illinois, serving in this capacity until 1915. It was during his incumbency that he campaigned for and secured the necessary appropriation for the magnificent building which was to house the Ceramic Engineering Department and the Geological Survey.

In 1915–1917, he was ceramic engineer for the Dunn Wire Cut-Lug Brick Co., Conneaut, Ohio.

During 1917–1923, inclusive, he was chief ceramist and superintendent of the U. S. Bureau of Mines Ceramic Experiment Station, Columbus, Ohio. Here he investigated American graphites and bond clays and the properties of domestic white clays. He outlined and supervised the field work in connection with the kiln investigation in cooperation with the four heavy clay products associations for the purpose of conserving fuel and improving the quality of products.

He resigned from the U. S. Bureau of Mines to accept the position of assistant general industrial agent for the Central of Georgia Railway. He served in this capacity from 1923 to 1925. From 1925 to 1927, he was consulting ceramic engineer part time for the Central of Georgia Railway and part time for the ceramic industry.

It was on September 1, 1927, that he accepted the position of senior technologist in ceramics with the National Bureau of Standards, Washington, D. C.

Publications

(1) "Fluxing Power of Mica in Ceramic Bodies," *Trans. Amer. Ceram. Soc.*, **4,** 255–69 (1902).

(2) "Notes on the Production of Crystalline Glazes," *ibid.*, **6,** 186–97 (1904).

(3) "Making Front Brick Without Repressing," *Brick*, April, 1908.

(4) "A Cheap Enamel for Stoneware, I–II," *Trans. Amer. Ceram. Soc.*, **10,** 216–43 (1908); **11,** 605–18 (1909).

(5) (With J. M. Knote) "A New Type of Laboratory Test Kiln," *ibid.*, **12,** 124–28 (1910).

(6) (With B. S. Radcliffe) "Opalescence and the Function of B_2O_3 in the Glaze," *ibid.*, pp. 129–40.

(7) (With A. V. Bleininger) "A Study of the Vitrification Range and Dielectric Behavior of Some Porcelains," *ibid.*, 628–75.

(8) "Notes on the Manufacture of Enamel Brick with Some Investigations on Enamel Brick Slips," *ibid.*, pp. 711–67.

(9) "Influence of Variable Silica and Alumina on Porcelain Glazes of Constant RO," *ibid.*, **14,** 62–70 (1912).

(10) (With G. H. Baldwin) "Cobalt Colors Other Than Blue," *ibid.*, pp. 764–77.

(11) (With R. K. Hursh) "Designs of Seven Test Kilns," *ibid.*, **16,** 431–44 (1914).

(12) (With W. L. Howat) "Deformation Temperatures of Some Porcelain Glazes," *ibid.*, pp. 454–60.

(13) (With R. K. Hursh) "Tests on Clay Materials Available in Illinois Coal Mines," *Ill. Mining Invest. Bull.*, No. 18, 130 pp. (1917).

(14) "Behavior Under Brass Foundry Practice of Crucibles Containing Ceylon, Canadian and Alabama Graphites," *Jour. Amer. Ceram. Soc.*, **2** [3] 208–26 (1919).

(15) (With H. G. Schurecht) "Effect of Variable Pressure and Tar Content on the Briquetting of Alabama Graphite," *ibid.*, [5] 391–99.

(16) "Need of Technical Assistance in the Brick Industry" (President's Address), *ibid.*, **3** [3] 180–84 (1920).

(17) "Experimental Separation of Lime in Dolomite," *Jour. Franklin Inst.*, **190,** 739 (1920).

(18) (With G. A. Bole) "Refractory Possibilities of Some Georgia Clays," *Jour. Amer. Ceram. Soc.*, **6** [5] 663–73 (1923).

(19) (With G. A. Bole) "Washing Tests of Georgia Clays," *ibid.*, [6] 730–47.

(20) (With G. A. Bole) "Use of Sedimentary Kaolins of Georgia in Whiteware," *ibid.*, [7] 854–64.

(21) "Graphites for Brass-Melting Crucibles," *Metal Ind.* [*N. Y.*], **21,** 477–78 (1923); *Metal Ind.* [*London*], **23,** 466 (1923).

(22) (With Wilber Stout, W. J. McCaughey, and D. J. Demorest) "Coal Formation Clays of Ohio," *Ohio Geol. Survey Bull.*, No. 26, 4th series, 588 pp. (1923).

(23) (With G. A. Bole) "Graphite-Clay Crucibles for Steel," *Iron Trade Rev.*, **74** [7] 487 (1924).

(24) "Burning Problems of Industrial Kilns." An investigation by the U. S. Bureau of Mines and the Face, Common, Paving Brick, and Hollow Tile Associations, 1924.

(25) (With G. A. Bole) "Utilization of Georgia Kaolins in the Manufacture of Face Brick," *Jour. Amer. Ceram. Soc.*, **7** [5] 347–58 (1924).

(26) "Distribution of Kaolin and Bauxite of the Coastal Plain of Georgia," *ibid.*, [7] 513–22.

* See also *Jour. Amer. Ceram. Soc.*, **6** [1] 97 (1923) and *The Bulletin*, **15** [6] 229 and [7] 263 (1936).

(27) "Some Properties of Refractories; Refractories for Electric Furnaces," American Electrochemical Society, p. 30 (1924).

(28) (With J. T. Robson, G. A. Bole, and J. R. Withrow) "Dead Burning of Dolomite," *Ohio State Univ. Studies*, **1** [2] (Oct., 1924).

(29) "Vast Wealth Stored up in Georgia Clay," *Clay-Worker*, **84** [3] 201 (1925).

(30) (With G. A. Bole) "Beneficiation and Utilization of Georgia Clays," *U. S. Bur. Mines Bull.*, No. 252 (1926).

(31) "Georgia Kaolins: Wilkinson County the Center of Production," *Ceramist*, **7** [4] 200–206 (1926).

(32) "Wear of Dies for Extruding Plastic Clay," *Bur. Stand. Jour. Research*, **12** [4] 501–17 (1934); R.P. 675.

(33) (With P. V. Johnson), "Performance of a Hollow-Ware Extrusion Machine with Different Combinations of Augers, Spacers, and Dies," *Jour. Research Nat. Bur. Standards*, **14** [6] 711–22 (1935); R.P. 798.

(34) (With P. V. Johnson) "Relation Between Moisture Content and Flow-Point Pressure of Plastic Clay," *ibid.*, **22** [3] 329–37 (1939); R.P. 1186.

(35) (With P. V. Johnson) "Properties of the Pore System in Brick and Their Relation to Frost Action," *ibid.*, **25** [6] 711–30 (1940); R.P. 1349.

(36) (With P. V. Johnson) "Saturation Coefficient Values for Brick by the Absorption-Boiling and the Absorption-Porosity Methods," *ASTM Bull.*, No. 109, pp. 17–18 (March, 1941).

(37) (With P. V. Johnson) "Relation Between Air and Water Permeabilities of Building Brick, " *Bull. Amer. Ceram. Soc.*, **20** [12] 443–46 (1941).

(38) (With P. V. Johnson) "Low-Cost Glazes for Structural Clay Products," *Nat. Bur. Standards Circ.*, C436, 20 pp. (March, 1942).

Patents

(1) "Composition, Process and Product (for Brick,") U. S. 1,576,558, March 16, 1926.

(2) "Whirlpool Classifier and Classifying Process," U. S. 1,629,182, May 17, 1927.

The loss of Ray Thomas Stull is indeed grievous. Although he would have been sixty-nine years of age this March, he was still in his prime; vigorous of body and of mind. His legions of friends and acquaintances will miss his genial personality as well as his valuable contributions to ceramic knowledge.

REPORT OF BOARD OF TRUSTEES' MEETING, WEDNESDAY, DECEMBER 8, 1943, BATTELLE MEMORIAL INSTITUTE, COLUMBUS, OHIO

Those present were J. B. Austin, C. E. Bales, J. L. Carruthers, R. L. Fellows, E. H. Fritz, Frederick Heath, Jr., J. D. Sullivan, C. Forrest Tefft, L. J. Trostel, J. W. Whittemore, H. G. Wolfram, and Ross C. Purdy. J. E. Hansen and D. E. Sharp were present at the Executive and Finance Committee meetings on Tuesday.

(1) Minutes of Uniontown Meeting

Minutes of the meeting held at the Summit Hotel, Uniontown, Pa., September 17 and 18, were read as per the mimeographed copy issued with the following amendment:

"(*a*) Members present and not listed on the mimeographed report were J. B. Austin, E. H. Fritz, A. F. Greaves-Walker, and J. W. Whittemore."

(2) Report of Executive and Finance Committees

The following report was submitted:

"The Executive and Finance Committees, on a motion by Mr. Tefft, seconded by Dr. Austin, and unanimously carried, recommends to the Board of Trustees that Dr. Purdy be retired at the Annual Meeting in 1946, that he be continued at his present salary until that time, thereafter at half his present salary."

It was moved by Professor Carruthers and seconded by Professor Whittemore that this report be accepted and approved. Unanimously carried.

(3) Report of Committee on Associate Secretary

The report of this Committee is as follows:

"The Committee on Associate Secretary, with the knowledge of the retirement policy for Dr. Purdy, passed by the Executive and Finance Committees this morning, is now in a position to consider positive recommendations to the Executive Committee and the Board of Trustees.

"We believe that it is essential in interesting a prospective candidate that we be able to outline definitely at least a part of his duties. The Associate Secretary should be responsible in the general activity to the Secretary until Dr. Purdy's retirement. On the other hand, certain specific duties and responsibilities should be delegated to the Associate Secretary by the Executive Committee. For example, the Associate Secretary could be responsible for advertising, promotional activities, and *The Bulletin*.

"We do not believe that it will be possible to secure a proper man for the job for less than $5000 per year, and probably more. It may be necessary to permit the Associate Secretary to carry on some consulting work, not to exceed 25% of his time, to compensate for the relatively poor salary which we can pay. Our Committee wants an expression of policy on this matter from the Executive Committee."

It was moved by Professor Carruthers and seconded by Professor Whittemore that this report be accepted and approved. Unanimously carried.

(4) Nominating Committee

Nominations of the Nominating Committee, consisting of the present president and the two immediate past-presidents, were by motion of Mr. Heath and Dr. Austin received and referred to the Trustees representing the Divisions and Classes. It was moved by Dr. Austin and seconded by Mr. Tefft that the Trustees elect for nomination by majority vote.

(5) Appreciation to Battelle Memorial Institute

It was moved by Mr. Fritz and seconded by Mr. Wolfram and unanimously carried that a vote of appreciation be given to the Battelle Memorial Institute, Clyde E. Williams, Director, and J. D. Sullivan, for making available the meeting room for the committees on Tuesday and the evening meeting of the Central Ohio Section and the Wednesday meeting of the Board, also the luncheon on both Tuesday and Wednesday and a social hour of cider and doughnuts on Tuesday night following the lecture.

This appreciation was given in person to Mr. Fenton by President Bales. A formal communication will be sent in confirmation.

(6) Organization of Cement Division

President Bales read the following letter from J. B. Alexander, dated December 2:

"Dear Mr. Bales:

"During the recent meeting of the Portland Cement Association in Chicago I contacted a number of the members relative to the proposed Cement, Lime, and Gypsum Division of The American Ceramic Society. As a result, I am thoroughly convinced that the proposed Division is hopeless at present, as far as the cement industry is concerned.

"Practically everyone thought that the formation of such a Division during the war period was particularly ill advised. In addition, some thought that the cement industry should have its own Division, as they did not feel that technically they were closely related to the gypsum and lime industries. This, of course, would make the problem still more difficult.

"Roy Young of the Lehigh offered a rather practical suggestion that we continue an active membership campaign in the cement industry and not attempt to form any Division until we have a sufficient number of members in The Society.

"Several of those who favored the formation of the proposed Division will not become members unless the Division is formed. As things now stand, I do not believe we can be assured of more than five or six members from the cement industry.

"I would, therefore, recommend that we abandon any idea of including the cement industry in the proposed Division for the time being, and see if Dr. Simpson and Mr. Nieman can secure enough members to form a Lime and Gypsum Division.

"I am hopeful that I can get at least four new members for The Society from the cement industry in the near future.

(signed) J. B. ALEXANDER, *Chief Chemist, Southwestern Portland Cement Co., Osborn, Ohio*

"cc: H. E. Simpson, H. E. Nieman, Ralston Russell, Jr., and R. C. Purdy."

This letter was discussed quite completely, and a decision was made to follow through further with the lime producers.

(7) Organization of Design Division

The following report from Walter A. Weldon was read:

"A REPORT TO THE BOARD OF TRUSTEES,
DECEMBER 7–8, 1943,
DIVISION OF CERAMIC DESIGN

"As Chairman of the Division of Ceramic Design for the year 1943, I am delighted with the real progress we are making in laying down a foundation that, with the right leadership, should carry on for years to come.

"The returns to date on the questionnaire have been most helpful and a total of 47 replied, 95% of which approve of the movement.

"New interest on the part of ceramic designers is high, and we can see material for leaders who will carry on. A number of outstanding members of The Society have written me most interesting letters approving the new setup.

"We are planning to devote two whole days of the Pittsburgh Meeting to whip things into shape, and at that time will discuss future plans for an Institute of Ceramic Design. This is an important step and will require long discussion to set up the machinery to make it function for the long pull.

"We have three speakers lined up and will institute a discussion period, which has been so badly needed in the past.

"I trust that you can arrange to publish all interesting returns from the questionnaire at an early date.

(signed) WALTER A. WELDON, *Chairman*"

It was moved by Dr. Austin and seconded by Mr. Sullivan that the report be accepted and filed. In the discussion, it was the unanimous opinion that every support should be given to Walter A. Weldon in the reorganization of the former Art Division into the Division of Ceramic Design.

(8) Membership Report

The following report from Ralston Russell, Jr., was read:

"REPORT OF MEMBERSHIP COMMITTEE
ON CLASSIFICATION OF MEMBERS

"Looking toward the postwar period as well as at the immediate present, it appears that The American Ceramic Society can affiliate an increasingly larger number of members and thus perform a greater service through the expedient of adopting a new plan for classification of its members.

"The Society will prosper and be stronger the larger the number of interested members it can maintain on a permanent basis, and any successful membership plan must provide for (1) the affiliation of all prospective members at the earliest possible age, (2) the continuance of the membership of all interested members, and (3) the welfare and security of The Society.

"In the discussion of membership plans, it is to be kept foremost in mind that membership must be made as attractive as possible, financially and otherwise, so that nonmembers may be interested initially, and then finally maintained as permanent members. Insofar as finances are concerned, any membership plan must be of such nature as to provide the maximum incentive consistent with Society security.

"The Society officers appreciate the desirability of having more intimate contact with the students in our ceramic schools, and it is understood that concerted efforts will be made to make personal contacts as often as possible to describe the benefits of membership and to show the students that The Society is interested in them. This effort will, of course, be most productive in the postwar period when the student enrollment is again normal. The following membership plans are not meant to conflict in any way with other membership efforts.

"The membership classification plan is based on the premise that many prospective members fail to affiliate simply because they do not feel they can afford the current annual dues. Those who appreciate the benefit derived from The Society realize the fallacy of such reasoning, but nevertheless appreciate the fact that a more attractive arrangement for those in the younger age groups would induce many of them to become members. With a progressive membership plan, the young members will be much more likely to continue membership until the age is reached at which they are in a financial position to pay full dues. At that age, the members will have acquired the habit of membership and will have come to realize the benefits of membership, so there should be no appreciable loss of members.

"The importance of forming the habit of membership and starting a collection of The Society's publications at an early age cannot be too strongly emphasized.

"With these considerations in mind, the following membership plan is proposed for discussion. It is hoped that this or a modified plan will be adopted at an early date by the Board of Trustees and the necessary action taken to incorporate it into The Society Constitution.

"MEMBERSHIP CLASSIFICATION

"(1) *Student Member:* Dues $2.50. To apply while member is a student and for one year subsequent.
"(2) *Active Member (Class 3):* Dues $6.00. To apply until year in which member reaches the age of 26. Full membership and privileges.
"(3) *Active Member (Class 2):* Dues $9.00. To apply until year in which member reaches the age of 31. Full membership and privileges.
"(4) *Active Member (Class 1):* Dues $12.00. To apply during year in which member reaches the age of 31 and thereafter. Full membership and privileges.
"(5) *Fellow Member:* Dues $15.00.
"(6) *Honorary Members, Ex-Officio Honorary Members, and Life Members.*
"(7) *Corporation Members:* Dues $25.00.

"Regarding the preceding classification, there are several factors which merit discussion:

"*Amount of Dues:* The dues assigned to each membership class are arbitrary and should be such that the total income to The Society is sufficient for sound operation. I anticipate that the dues suggested may need adjustment so that the total income will be the required amount. In making this adjustment, it would seem to be desirable to keep the student and low age-class dues as low as possible to provide incentive and to raise the upper age and Corporation dues if necessary to meet any deficits.

"*Number of Membership Classes:* Some may feel that there should be only one intermediate membership class between students and the highest-dues class for the sake of simplicity. Two intermediate classes would, however, seem to be preferable, because of the provision for a more

gradual increase in dues as a member is maturing, thus affording less reason to drop membership than would be entailed by having two rather than one intermediate class, and the added incentive and reduction in membership losses would well justify the two intermediate classes. Also bear in mind that earning power in most cases increases only gradually, so any abrupt change in dues must be avoided.

"*Status of Members in Different Classes:* The existing plan of having students ineligible for voting and offices is satisfactory. It is not desirable to withhold any such privileges from any other members even though the dues for low-age classes may be lower. Moreover, all classes of members above students should be called 'Active Members' in preference to calling them 'Junior' and 'Associate Members.' There is no real reason to assign a man inferior ranking in The Society simply because he is young and is granted a low rate on dues. Where experience is to be rated, as in the case of the Institute of Ceramic Engineers, there is justification for this, but our objectives are to induce persons to join The Society and to maintain membership to allow The Society to serve in its broadest capacity. We therefore should avoid terms which give any indication of inferiority even to members who may be inferior in experience, and the simplest procedure is to call all of them Active Members after they are no longer students.

"The same logic applies to the provision of voting and office-holding privileges. In addition, we should carefully avoid any such restrictions, because it is often desirable to have young men serving on committees in view of the training they receive and the greater interest which they often manifest. Certainly none of the young members will rise to the higher offices until they have matured, so any restriction on office holding is superfluous.

"*Determination of Age for Classification:* Some feel that the proposed classification may complicate the bookkeeping materially, that difficulty would be experienced in determining a member's dues, and that falsification of age would sometimes result. All of these possible difficulties can be reduced to relative unimportance by recording the age of each new member at affiliation. His office record card would show this age and the years in which a change in classification would occur. Then regardless of the number of changes in dues, it would be a simple matter each year for the office to assess the correct dues. Presumably some initial falsification of age would result in a financial loss, but as age classification automatically changes at certain periods, no member would profit indefinitely. Moreover, the total loss to The Society through such practices would, I feel, be negligible. Certainly any added bookkeeping involved with the proposed plan would be justified.

"Considering all of the preceding factors and the suggested plan, I trust that the Board will be able to select a final plan or at least to recommend a tentative plan for further consideration. I will be glad to offer the assistance of the Membership Committee in any manner required.

(signed) R. RUSSELL, JR., *Chairman, Membership Committee*"

This report was unanimously filed, without recommendations, by motion of Mr. Fritz, and was seconded by Mr. Fellows. It was, however, discussed most thoroughly by Mr. Sullivan, Professor Whittemore, Professor Carruthers, and others. Mr. Wolfram suggested the possibility of a Student Division. Professor Whittemore referred to the student forum and to the student employment services which have been interrupted by war conditions but which should be renewed. Professor Whittemore stated that the students could well afford and would gladly pay $5 while in the university and that $5 was not too high. Professor Carruthers suggested that the $5 for student membership be retained, but that possibly it would be well to give a rebate to the Student Branch of 10%, provided that they secure 70% of the students registered in the Department. The suggestions made by Dr. Russell in his report were not agreed upon.

(9) Committee on Publications

John D. Sullivan, *Chairman*, had no formal report to make. The data for the year have not been compiled.

(10) Report on Nominations

The following nominations were submitted by representatives of the Divisions and Classes, also their proxies, selected by majority vote from the names submitted by the Special Committee, consisting of the present president and the two immediate past-presidents:

For President: E. H. FRITZ
For Vice-President: C. FORREST TEFFT
For Treasurer: JOHN D. SULLIVAN

(11) Report of the Budget Committee

Following is a report of the Budget Committee which, by motion of Mr. Trostel and Professor Whittemore, was accepted:

Cost of printing	$20,000.00
Office expense: Editor	800.00
Abstracts	800.00
Office expense: Secretary	2,000.00
Salaries	25,400.00
Postage	1,600.00
Office rental	1,440.00
Office equipment	500.00
Divisional expense	100.00
Traveling	600.00
Contingent fund	200.00
President's expense	200.00
Total	$53,640.00

This report was thoroughly discussed. The items of salaries and office rental were increased to provide for the Associate Secretary.

(12) Report of Committee on Classification and Nomenclature

The following report, submitted by M. F. Beecher, *Chairman*, was by motion of Mr. Tefft and Mr. Trostel unanimously accepted and filed.

"PROGRESS REPORT ON COMMITTEE ON CLASSIFICATION AND NOMENCLATURE

"The program set up by this Committee on August 9, 1943, was to provide generally acceptable definitions for some or all of the following terms, the same to be submitted to the Board of Trustees for official action.

Ceramic (adjective)	Ceramic Engineering
Ceramics (or Ceramic) (noun)	Ceramic Art
Ceramic Technology	Ceramic Science

"The work of this Committee got off to a rather slow start this year, which is entirely the responsibility of the Chairman. There has been excellent response from the members, both with respect to promptness in considering assignments and also in the evident thought and care which they have been giving to this matter of definitions.

"There has accumulated, therefore, quite a number of definitions covering the terms listed. They differ rather markedly in construction and to some extent in meaning. All, however, have merit in some particular and represent a definite contribution to the problem before us.

"The real work of the Committee is therefore just beginning. It will be our endeavor to arrive at some reconstruction of the best definitions thus far offered through debate and compromise so that agreement within the Committee can be reached. We are hopeful, and justifiably so, that this piece of work can be completed before the next Annual Meeting.

(signed) M. F. BEECHER, *Chairman*"

There was considerable discussion on this report, also a recital of the efforts made by the Public Relations Committee, under the chairmanship of V. V. Kelsey, to secure larger publicity.

As stated in the report of the meeting of September 17 "Dr. Greaves-Walker will collect publicity articles on what ceramics has done for the war." President Bales will follow through with Dr. Greaves-Walker on this.

(13) Report on Arrangements for the 46th Annual Meeting

The General Secretary reported that for speakers at the General Session he has contacted the following who have consented to speak: Edward R. Weidlein, Mellon Institute, Pittsburgh, Pa., I. W. Clark, Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., and Robert A. Weaver, Ferro Enamel Corp., Cleveland, Ohio.

Correspondence has been had with Gordon Lippincott on Industrial Design, Carl Hovgard, President of the Research Institute of America, Inc., and Major Albert J. Stowe of the Military Intelligence.

Correspondence is still being had with James Lincoln and others of national reputation.

(14) Balloting for Officers

The one-ballot plan was thoroughly discussed, and a sample ballot was shown. General Secretary Purdy suggested that the ballots be made on separate cards, as has been the practice, but that all the cards be assembled and sent to the proper voters in one envelope, to be returned by them in one envelope for the officers of The Society and the officers of the Divisions. This was left to the General Secretary to work out, following the suggestion of W. Keith McAfee.

(15) Report of Committee on Rules

The following letter to the members of the Rules Committee by W. Keith McAfee was read in its entirety:

"The complete pattern for the nomination and election of the officers of The Society and its various branches is now evident. While formal approval by the Board of some Rules changes is still required technically, any changes will be editorial in nature without changing the contents.

"Some Classes and Divisions have already made some changes in their respective Rules to try to keep up with the shift in policy of The Society while some have waited until the job was completed by the Board of Trustees.

"Under the former setup, nominations for the officers of The Society were made by two Nominating Committees, one designated Committee A and one designated Committee B. Each Class and each Division was required to elect one representative on each Nominating Committee. Most Classes and Divisions used these same two representatives on the Nominating Committees of The Society as their Class or Division Nominating Committee.

"Separate ballots for The Society officers, for each Class, and for each Division were circulated, collected, and counted. Two changes have been made. First, the Board of Trustees was authorized by The Society, through amendment of the Constitution, to take over the duties of Committee A. Provision was made in the By-Laws for any 25 members to act as a second Nominating Committee, in other words, whenever desired, the function of the former Committee B.

"Both A and B, as such, were abolished and hence election of their members by the Classes and Divisions is no longer required. All Class and Division Rules should be changed accordingly and provision made for new Class and Division Nominating Committees when not already independently provided for.

"The second change was to combine the ballots for the Divisions with the ballot for the officers of The Society. Every member of The Society is supposed to be a member of one of the Divisions, to vote for a Trustee, if for no other reason. Membership in a Class is gained through election by that Class, and many members of The Society are not members of any Class. For that reason, it was decided by the Board of Trustees to retain separate ballots for officers of the Classes (and of the Fellowship) and that the elimination of separate Division ballots was as far as the election machinery could be simplified at that time.

"The Class and Division Rules should now be amended to eliminate all reference to the Society Nominating Committees A and B. Where necessary, nominating committees should be provided either by election or appointment. The Society requirements were that the Trustee must be elected, or any vacancies in Trustee representatives must be elected, not appointed, except for the period between occurrence of vacancy and next annual election (note the appointee may be elected) and that the affairs of the Division be managed by a Chairman, Secretary, and such other officers as may be desired by the Division and that all be elected for a one-year term.

"Provision must be made to forward the names of nominees for Division officers, after their respective acceptances have been obtained, to the General Secretary at least 70 days before the opening date of the Annual Meeting (in this case before January 23, 1944).

"I am sending a copy of this letter to each Division Chairman and to the chief officer of each Class to facilitate your discussion of this problem with them. Please keep numbering systems consistent. All these changes will be in your Article VII:

"Section (1):

"If this Section of your Rules reads like that of 'Suggested Form for Division Rules,' it must be rewritten to provide for creation of a Class or a Division nominating committee, as the case may be. If a second committee is desired or provision for nomination by petition, it should be covered in Section (2).

"Section (3) (of Division Rules only):

"Must provide that one (or two) Division Nominating committees prepare one (or two) slates for Division officers, obtain acceptance in writing from the candidates, and forward the names to the Division Chairman 90 days before the opening date of the next Annual Meeting (this year before January 3, 1944).

"Section (4) (*a*) (of Division Rules only):

"Must provide that one (or two) Division nominating committees shall nominate a candidate (or two candidates) for the office of Trustee representative of the Division and shall forward their names together with their acceptances in writing to the Chairman of the Division at least 90 days before the opening date of the Annual Meeting of The Society at which the triennial term of Trustee representative expires or when there is an interim vacancy to be filled.

"Section (4) (*b*) (of Division Rules only) change to read:

" 'The Chairman of the Division shall transmit the nominations to the General Secretary of THE SOCIETY at least 70 days before the opening date of the next Annual Meeting of THE SOCIETY.' (Note second paragraph is eliminated.)

"Section (4) (*c*) (of Division Rules) should be eliminated.

"There is one other change in the By-Laws of The Society requiring amendment of Division Rules. Please refer to following changes in Article B XII of the By-Laws eliminating the Data Committee as a standing committee of The Society and creating the Committee on Classification and Nomenclature. It is hoped that all Divisions will appoint representatives on this new Committee. If your Division does so, it should be provided in your Article XII, Section (1) (*h*), and Section (9).

(Signed) W. KEITH MCAFEE, *Chairman, Rules Committee*"

REPORT OF THE RULES COMMITTEE

"The following amendments to the By-Laws of The Society have been adopted by the Board of Trustees at the time of the last Annual Meeting and are now in effect:

"Article B IV:

"Change title to read 'Board of Trustees' and renumber present three paragraphs (3) (*a*), (*b*), and (*c*).

"Add a new section before these paragraphs as follows: '(2) The term of office of a Trustee representative of a Class or of a Division shall end immediately upon his election as President, Vice-President, or Treasurer of THE SOCIETY.'

"Article B VII, Section (5) (*a*) and (*b*) change to read:

"(5) (*a*) In the event of election as President, Vice-President, or Treasurer of THE SOCIETY or in the event of refusal to act, incapacity to act, or the resignation of a Trustee representative of a Class, a successor may be appointed by the officers of the said Class to serve until the next Annual Meeting, at which time the members of

such Class shall elect a successor to fill the unexpired term, if any remains, as provided in the Rules of such Class not inconsistent with the Constitution and By-Laws.

"(*b*) In the event of election as President, Vice-President, or Treasurer of THE SOCIETY, or in the event of refusal to act, incapacity to act, or resignation of a Trustee representative of a Division, a successor may be appointed by the officers of said Division to serve until the next Annual Meeting at which time the members of such Division shall elect a successor to fill the unexpired term, if any, as provided in the Rules of such Division not inconsistent with the Constitution and By-Laws.

"Article B XII, Section (1) (*b*), change 'Data' to read 'Classification and Nomenclature.'

"Section (9) replace by the following: '(9) The Committee on Classification and Nomenclature shall consist of the Chairman of the Classification and Nomenclature Committee of those Divisions having such a committee. The Chairman shall be appointed by the Board of Trustees. It shall act in an advisory capacity to the Board of Trustees and shall endeavor to develop a uniform classification and nomenclature for the Ceramic Industry.'

"The following amendments to the Rules of The Society have been adopted by the Board of Trustees at the last Annual Meeting and are now in effect:*

"Article R VII, Sections (1) (*a*) and (*b*):

"(1) (*a*) To facilitate selecting nominees for President, Vice-President, and Treasurer of THE SOCIETY, the incoming President may, promptly after the Annual Meeting at which he takes office, appoint a Trustees' Nominating Committee of three from the members of the Board or Past-Presidents of THE SOCIETY. It shall be the duty of this Committee to make confidential recommendations to the Trustees and present available biographical data on the proposed candidates.

"(*b*) The President should transmit to the Trustees' Nominating Committee the names of all suggested candidates he may receive from the membership.

"When the Board of Trustees has come to decision on these matters, the Division and Class Rules can be brought into conformity. The amendments to the By-Laws and Rules of The Society should be immediately published and as soon as practical the Constitution, By-Laws, and all Rules of The Society and its various branches should be published in one issue of *The Bulletin*.

"The Board should also formally adopt an amendment to the By-Laws, Article B X, Section (1) (*a*), changing the name of the 'Art Division' to 'Design Division.'

(signed) W. KEITH MCAFEE, *Chairman, Rules Committee*"

COPY OF LETTER FROM W. KEITH MCAFEE TO C. E. BALES, DATED DECEMBER 6, 1943

"I am enclosing, herewith, the report of the Rules Committee for your information at the forthcoming meeting of the Board of Trustees. I have sent a copy of this to each member of the Rules Committee, each Division Chairman, and to the presidents of each of the two classes together with a letter to the members of the Rules Committee indicating what action must now be taken to bring Division and Class Rules into conformity with the Constitution, By-Laws, and Rules of The Society.

"I summarize, herewith, the action the Board of Trustees should take, if they follow my recommendations in finishing up this matter. The By-Laws should be amended as follows:

"Article B VII:

"Section (3) (*a*) Substitute 'thirty (30)' for 'seven (7).'

"Section (3) (*b*) Substitute 'at least 15 days before the opening date of the Annual Meeting' for 'on or before the opening date of the Annual Meeting.'

Article B X:

"Section (1) (*a*) change 'Art Division' to 'Design Division.'

"The Rules of The Society should be amended as follows:

Article R VII:

"Section 3 (*a*) and (*b*) (as given in the previously published portion of the Report of the Rules Committee).*

"Inasmuch as under existing By-Laws and Rules the General Secretary must publish the names of your candidates for President, Vice-President, and Treasurer seventy days before the Annual Meeting, or before January 23, 1944, I would suggest that, if possible, you make your selections at the time of this meeting, so that Ross can run them in the next *Bulletin*.† You will also probably have to follow up my hint to the Division Chairmen to have their respective nominees in the hands of Ross, so that he can have them printed on the combined ballot.

(Signed) W. KEITH MCAFEE, *Chairman, Rules Committee*"

(16) Re-Employment of General Secretary for Two Years

The General Secretary, Ross C. Purdy, was elected to serve for another two years, i.e., 1944 and 1945. This was on motion by Mr. Heath and Mr. Fritz and unanimously carried.

(17) Status of Fellows and Appointment of Committees by Fellows

Considerable discussion was had on the status of the Fellows, without definite action. J. B. Austin is to discuss with Dean Robert B. Sosman the suggestion that the Fellow classification be continued as a means for honoring members, that the management of the Fellow classification be given to the Board of Trustees, and election to Fellowship be by the same secret jury system as now prevails; that the Orton Fellow lecture be continued; that the Fellows as an organization dissolve, turning the finances into The Society's general fund.

(18) Adjournment

On motion of Professor Carruthers and Mr. Fellows the Board of Trustees adjourned at 4:00 P.M. to accept the invitation extended by John D. Sullivan to inspect the Battelle Memorial Institute laboratories.

Respectfully submitted,

ROSS C. PURDY,
General Secretary

* For Rules changes adopted to implement this action, see portion of Rules Committee report published in *Bull. Amer. Ceram. Soc.*, **23** [1] 7–8 (1944).

† See *ibid.*, p. 6.

TESTING AND CLASSIFICATION OF BALL CLAYS

Symposium II, 45th Annual Meeting, April, 1943

Revised Discussion Outline

BY RALSTON RUSSELL, JR., AND ARTHUR S. WATTS

I. Introduction

II. Basic Investigation Methods

III. Selection and Preparation of Representative Clay Samples

(1) Mine vs. Plant Selection
(2) Physical Form of Clay Samples: Lump vs. Air-floated vs. Disintegrated Samples
(3) Wet Clay vs. Dried Clay; Drying Procedures; Storage and Distribution of Samples

IV. Standard Compositions

(1) Clay vs. Clay-Flint vs. Standard Body Mixtures
(2) Choice of Standard Materials; Water Selection; Compensation for Moisture in the Materials

V. Specimen Preparation

(1) Batch Preparation; Aging

(2) Plastic Extrusion vs. Hand Wedging; Deairing
(3) Standardization of Moisture Content for Molding; Method of Determination
(4) Drying Procedure; Storage of Test Specimens

VI. Determination of Drying and Unfired Properties

(1) Rate of Drying
(2) Drying Characteristics: Cracking, Warping, Discoloration
(3) Drying Shrinkage (Basis for Calculation); Dry Transverse Strength

VII. Miscellaneous Discussion

(1) Fellowship Proposal

Condensed Report of Symposium II

I. Introduction
(R. Russell, Jr.)

The Testing and Classification of Ball Clays had its inception as a project of the White Wares Research Committee in 1941 following discussions by a representative group of members. The subsequent favorable response of divisional members, the producers of ball clays, and various research and academic institutions encouraged the Committee to proceed with plans for the project.

The task of developing the project was made much more difficult by wartime conditions, and it is to be expected that activity must necessarily be somewhat restricted for the duration.

The report of the initial symposium held at Cincinnati in 1942 was published in *The Bulletin*.[1] The second symposium, of which this is a condensed report, was held at Pittsburgh in 1943. The Materials and Equipment Division joined with the White Wares Division for both symposia, and the Enamel Division was present for Symposium II.

Symposium I dealt with the use of ball clays in various whiteware and with general test methods. Symposium II was devoted to specific methods of material selection and distribution, sample preparation, and test procedures, although the discussions were by no means completed and will merit resumption.

The revised discussion outline used for Symposium II is given at the beginning of this report. This outline includes those points which were actually discussed and is only a portion of the final complete outline.

The objectives of this project in its current conception are as follows:

(1) *The development of standardized methods of testing and control and the universal adoption of these methods for ball-clay testing.*

(2) *A study and correlation of the fundamental vs. the general physical properties of ball clays to permit better understanding in their testing, selection, and use.* This is simply an attempt to interpret the relationship which exists between the more abstract fundamental properties (grain size, surface characteristics, organic content, etc.) and the more commonly determined physical properties (water of plasticity, shrinkage, strength, etc). It is believed that the ability to interpret these common properties in terms of the more fundamental properties would represent a real advancement.

(3) *Increased knowledge and insight into the reasons for the characteristic nature of clays.* This objective implies a better understanding of how and why different clays have acquired their composite, individualistic characteristics.

It should be pointed out that, according to the currently adopted viewpoint, there is no reason to attempt an actual complete classification of commercial clays on the basis of their properties and uses. Any classification would, of necessity, be limited in scope; as, for example, an attempt to collectively classify the clays on the basis of one particular property for the sake of correlation.

[1] *Bull. Amer. Ceram. Soc.*, **21** [11] 248–91 (1942).

This elimination of the complete classification of commercial clays as a final objective removes the main point of disagreement which has existed between the various groups interested in this project.

Before proceeding with further discussion, all should understand that this is *not a Committee project*, but a group project toward which every person interested in the production, marketing, testing, or use of ball clay should contribute and become a sponsor because of the individual responsibilities growing out of a common interest in ball clays. Suggestions, constructive criticism, discussion, and questions are earnestly solicited at any time, for it is only through the careful consideration of all factors that the best ultimate solution can be accomplished.

II. Basic Investigation Methods
(R. Russell, Jr.)

The subject of "Basic Investigation Methods" deals with plans for sample selection, distribution and treatment, specimen preparation, the testing of materials and specimens, and the collection, correlation, and interpretation of results.

Following the adoption of satisfactory methods and procedures as a result of this and subsequent discussion, actual laboratory and plant testing will be in order. Unless a fellowship plan of investigation is adopted, the clay samples will be distributed to various laboratories with specific assignments as to the properties for determination. Several representative clays may also be tested by a number of whiteware manufacturers in both commercial and standard bodies to determine the effect of the clays under different manufacturing conditions. Standardized test methods will be used insofar as possible.

The final stage after assembling the various data will consist of analyzing and interpreting the results in terms of the objectives previously set forth. Then will follow the publication of the results, the interpretations, and all test methods.

III. Selection and Preparation of Representative Clay Samples
(1) Mine vs. Plant Selection

J. R. Beam recommended that the samples for testing be obtained from commercial-run carload shipments of shredded clay available at various manufacturing plants. The samples should be selected from various locations of the car by taking several 10-pound samples at least 1 foot below the surface. The large sample thus obtained should be reduced to the required quantity by accepted quartering methods. In answer to a question by L. F. Powell, it was stated that any particular clay sample would represent an average collected from several carloads over a period of two or three months.

Mr. Powell suggested that a simpler method might be an accumulation of the sample at the mine over a period of a month at the rate of 10 pounds per day. It was pointed out by Dr. Russell that the producers could be relied upon to supply truly representative samples. A. S. Watts signified that in forty years of obtaining samples from producers he had never experienced any embarrassment as a result of being sent a picked sample. Moreover, he felt that the experience of a producer with variations of each day should particularly qualify him to select a truly representative sample. Certainly no producer would submit a specially selected sample which could not be duplicated in commercial practice.

It was felt by C. M. Lambe, however, that plant selection of clays was preferable and that selection of clay samples from the cars should take into consideration the horizontal as well as the vertical distribution. R. F. Geller stated that a standard sample for evaluating laboratory procedures would be satisfactory as selected from only one car, and the only disadvantage would be a sample of limited representation.

W. K. McAfee stated that one disadvantage of taking clay directly from the mine would be the loss of the benefit of blending which derives from shredding in the usual manner. He and Mr. Powell then agreed that the mine

selection plan might be revised to a selection while the loading of shredded clay for shipment is taking place.

R. E. Gould expressed confusion as to whether this sample selection referred to a procedure for use by individual companies in routine sampling or to the collection of representative samples of identifiable clays for the general testing program as a part of this project. Dr. Russell explained that these plans dealt with clays for the project testing program rather than for routine methods of control.

Mr. McAfee stated that a clarification of the reasons for sample collection would lead to the proper method of selection. He pointed out a similarity between our objective of standardizing clay tests and similar programs for feldspar and for the chemical durability of glass, both of which were conducted under the supervision of the National Bureau of Standards with beneficial results. Dr. Russell then reported that the sample collection was being made in a manner not only to provide average samples of different clays so that identical samples might be submitted to different laboratories for standardized testing, but so that at the same time it would be possible to collect data on the representative properties of each specific clay in case any such data were ever required. The distribution of identical samples for testing was considered to be of primary importance by Mr. Geller rather than the attempt to obtain representative samples, as he felt that no sample selected would necessarily be representative of the same material supplied at a later date.

C. W. Hall emphasized the absolute necessity of extending the sampling period as much as possible for the sake of true representation. It was also recommended that the producers should reserve or receive representative samples for their own confirming tests. It was agreed that this was very desirable.

R. C. Meeker raised the question of selection of the clays for testing. Dr. Russell opined that all producers would be contacted in an effort to determine the clays most widely used and available for future consumption, so that a logical selection of representative clays for test might be made.

Mr. Meeker then asked whether or not student help would be relied upon for those tests conducted at university laboratories. Dr. Russell declared that student help would probably be required, but not without proper supervision, and that the nature of any such assignments would be consistent with a student's interest and experience. The possibility of graduate thesis topics was suggested.

Professor Watts emphasized the need for accurate testing, but stated that with the adoption of specific methods of test and proper supervision there was no reason to expect unreliability of results with student help.

It was emphasized by G. W. Kauper that the first objective should be the development and adoption of standard test methods for universal use, and this was in agreement with a prior proposal of Mr. Gould which led to the adoption of the first objective set forth in the introduction.

Mr. McAfee pointed out that standardization of a product by the consumer is not a desirable practice and that the initiative should come from the producers. Although this would seem to be a sound premise, Dr. Russell was of the opinion that, in this instance, a group consisting essentially of ball-clay consumers, but including also the producers, must, of necessity, initiate and develop standardized procedures for ball clays. The ball-clay producers generally agree that they are in no position to undertake such a project alone, and this throws the major burden upon the members of the White Wares Division, who, for the most part, are consumers of ball clays. It is hoped that the results will nevertheless be constructive and useful to producers and consumers alike.

(2) Physical Form of Clay Samples: Lump vs. Air-floated vs. Disintegrated Samples

L. E. Thiess stated that the clay supplied in disintegrated or shredded form was most desirable both in regard to uniformity of sample and the ability of producers to supply clay in the required condition. It was felt that air-floated clay could also be used satisfactorily, but there is the disadvantage that all clays are not available in air-floated form. Clay in lump form was considered to be the least desirable because of nonuniformity.

H. Thiemecke reported favorably on the use of shredded clay and mentioned a discrepancy between the dry-strength values of air-floated and shredded clays. Mr. Meeker also favored shredded clays for the same reason and stated that lignitish clays often show as much as 25% increase in dry strength as a result of air-floating, whereas little effect is noted for clays low in lignite. Another argument for shredded clay is its similarity to borings obtained in advance of mining. These borings may be used by the producer for test.

In conclusion, it was generally agreed that shredded clay should be the adopted standard.

(3) Wet Clay vs. Dried Clay; Drying Procedures; Storage and Distribution of Samples

Mr. Gould suggested that the ball-clay samples selected should contain enough of the original mined water to avoid any change in the properties as effected by excessive drying. The upper limit would be that beyond which shredding is difficult, and the lower limit would be such as to avoid the detrimental effects of drying. Storage should always be accomplished in a manner to avoid further drying.

Dr. Russell called attention to the possible desirability of eventually adopting limits of water content which will avoid excess shipping water without impairment of the clay properties, but warned against any high-temperature drying which would impair the plastic properties.

Professor Watts recognized the changes in properties effected by thorough drying, but still favored dried clay unless a method of storage could be worked out to avoid any changes in the water content during storage. He suggested limits of moisture content between 2 and 5% or between 3 and 6%.

The advantages of dried clay in regard to ease of slaking were expressed by Mr. Thiess. He also proposed that a study of the effect of drying might be enlightening.

Mr. Gould believed that the use of double moistureproof bags for all storage of samples after drying to proper limits of water content would retain the clay in the proper condition sufficiently long for all practical purposes.

The effect of drying upon soluble-salt analyses was mentioned by Mr. Beam. As soluble salts exert a major influence upon the plastic properties of ball clays, drying must be objectively controlled in establishing any standard.

The opinion was expressed by Mr. Lambe that the use of dried clay is undesirable because the properties are changed from those expected for commercial shipments of ball clays which always contain appreciable amounts of water. He suggested that any partial drying carried out objectively be done as slowly as practicable and that artificial heat be entirely avoided.

K. C. McCartt proposed that a complete record be kept of the date of mining and the method and extent of storage before testing, inasmuch as the aging of clay after storage has a distinct effect upon properties.

E. Hardesty reported that, to avoid the effects of aging as much as possible, a standard sample ten years old is employed for comparisons. Such a practice would not, however, be practical in many cases.

Professor Watts stated that each operator should exercise every precaution to avoid drying of a sample during storage beyond the adopted lower limit, whatever it may be. Promptness in testing was cited as a clue to the minimizing of any such difficulties. He felt, however, that certain practical variations in procedure should be tolerated, as it is a fallacy to hope for values of much greater accuracy than required. Thus, practical standardization should be the objective.

IV. Standard Compositions

(1) Clay vs. Clay-Flint vs. Standard Body Mixtures

A. J. Hedquist discussed the use of 100% clay for testing, as well as 50-50 mixtures of clay and flint according to the standard specifications of 1928. It was concluded that tests such as grain size, soluble-salt content, and other fundamental properties could be determined most expeditiously with 100% clay, whereas general opinion favored a 50-50 mixture with flint for the common tests such as shrinkage and strength. The necessity of using a standard flint was emphasized, although no decision was made as to whether this should be a certain grade commercially available or a large sample stored and distributed as required. It was also suggested that all other materials used in preparation of any standard bodies should be subject to close standardization.

In answer to a question by Mr. McCartt as to why a 50-50 clay-flint mixture is used at all, Dr. Russell explained that this is due to the better working and drying properties of a mixture containing some nonplastic and that the 50-50 mixture is simulative of the ratio between plastics and nonplastics in the average whiteware body. Feldspar is not used in conjunction with flint because it introduces a variable due to its solubility and surface activity.

Mr. Thiess described a test to determine the vitrifiability of ball clays using a 50-50 mixture. Broken specimens from the dry-strength test were fired and tested for water absorption.

It was related by Mr. Meeker that in testing the strength of ball clays he much prefers a mixture with flint as it reduces warpage, cracking, and the occurrence of laminas. Dr. Schramm, however, favored at least the concomitant use of some specimens made from 100% clay for tests such as shrinkage and porosity and suggested the possible use of small, thin specimens.

Professor Watts cited experimental evidence to indicate that shrinkage and strength tests were not reliable when made on specimens of straight ball clay and pointed out that the human equation is exaggerated. He also recommended the adoption of a mechanical method of molding wherever possible. Although it had been intimated that fired color was a property which might preferably be determined on clay alone, Professor Watts opined that the coloring effect in a mixture would be of greater value to the average consumer.

The use of round bars formed by mechanical extrusion was strongly recommended by G. W. Phelps as a result of his experience in testing many ball clays. He stated that specimens formed mechanically yielded many advantages, such as improved consistency of results and reduced time for forming.

Mr. Hardesty pointed out that the properties of a clay are, to some extent, dependent upon the type of body in which it is used. He cited a case showing strength effects of somewhat different magnitude from two clays used both in 50-50 clay-flint mixtures and in a standard body. He concluded that the most useful data would be obtained by using standard bodies, and this was in agreement with the opinion of Mr. Lambe. Professor Watts, however, stated that such information is of primary interest only to the individual, whereas the proposed testing must be comprehensive. Thus, the use of standard bodies actually is disadvantageous compared to a simple clay-flint mixture. It would seem that a general testing program should be conducted with the clay-flint mixture, whereas individual plant evaluation might advantageously use supplementary body tests.

F. P. Hall questioned whether or not some imported ball clays would be used and advised that a different sampling procedure would be required. Dr. Russell stated that the primary interest was in domestic clays, but that it was planned to test some imported clays in the fundamental investigation because their characteristic properties might prove to be enlightening.

(2) Choice of Standard Materials; Water Selection; Compensation for Moisture in the Materials

In the choice of standard materials, J. R. Kauffman suggested the possible use of widely known commercial brands. In addition to standardizing the materials such as flint, feldspar, clays, and plaster for molds, it was emphasized that the processing and equipment should be standardized. Otherwise the entire procedure would be of doubtful value. Thus, conformity of such things as forming procedure, plaster-mold preparation, die design, and firing procedures is desirable.

Distilled water was recommended for use throughout, although rain water was mentioned as a possible alternative. It was agreed that compensation for moisture in all materials on a dry-weight basis was satisfactory.

The possible use of Ottawa sand as an admixture with the clays was suggested, and Mr. Lambe cited tests to indicate that sand is preferable to flint for extruded specimens. He found, however, that erroneous results occur in the case of fatty clays due to swelling tendencies and thus favored the use of some china clay as a diluent.

Dr. Russell advised that all standard materials, such as flint and feldspar, should be chosen and samples obtained with the same care exercised in clay selection. It was pointed out that the simple method of using a particular commercial brand or a sample selected to conform in screen analysis would not be satisfactory, as it has been shown that the particle-size characteristics of such materials may vary substantially despite comparable screen analyses. This is understandable in view of the predominance of subsieve particles in flint and feldspar as normally used. Thus, it is necessary to adopt a subsieve method of control or possibly to obtain a quantity of each material at the outset sufficient to fulfill all demands.

W. F. Wenning suggested the possible use of a screened sample from which all subsieve particles had been eliminated; e.g., a sample of flint screened through 100-mesh and on a 150-mesh. Another method proposed by C. A. Styer is the use of a naturally weather-ground standard material in preference to one commercially ground. He reported success in the use of a waterworn sand as a standard and stated that this eliminated the variable of particle shape. Such particles were also said to be quite smooth and uniform and to be available as fine as 250-mesh.

It was then reiterated by Dr. Russell that an entirely practical solution was required and that it would be preferable to have standard materials which are readily available to all. The use of a weatherworn material in preference to a material artificially ground would depend upon relative uniformity and availability.

E. B. Read expressed the need for tactfulness in selecting standard materials and the undesirability of exerting any influence upon the general usage in industry. He felt that brand names should be kept secret, if possible, to avoid militating against competitive materials. Dr. Russell pointed out that the ability to follow this suggestion would depend upon the available supply in the absence of the provision of publicity for the cooperation.

V. Specimen Preparation

Dr. Russell reported that the Committee had decided to use the plastic process for the preparation of all test specimens. Plans to conduct parallel tests using the casting process were abandoned because of the extra work involved and because it was agreed that all properties of interest for casting could be considered in a later section entitled "Miscellaneous Properties of Clays." The dry-pressing method was considered because of its simplicity, but few felt that ball-clay specimens prepared in this manner would be truly representative.

(1) Batch Preparation; Aging

In discussing these subjects, Dr. Schramm advised that dry-mixing preparation would not be suitable for ball clays because no means is provided for the elimination of the large lignite particles. It was decided, therefore, that

the clay or clay-flint mixture should be prepared as a slip and passed through a 100-mesh lawn. It is worth noting that this procedure eliminates the possibility of using Ottawa sand as the nonplastic to replace flint, because of the coarseness of the sand with respect to the lawn specified. Dr. Schramm felt that each clay would require a characteristic amount of water for the preparation of a suitable slip. Suggestions were made to use a partially air-dried ball clay and a standard soaking period to facilitate blunging. A water temperature comparable to room temperature (approximately 73°F.) was recommended by the Committee for blunging.

The problem of slip dewatering offered some difficulties. Use of a small filter press would not always permit removal of the correct amount of water due to the impossibility of the operator judging consistency during pressing. The best alternative appeared to be dewatering by means of plaster molds or bats. Either personal skill or some type of plasticity test would then be used to judge the proper end point of drying, according to Dr. Schramm.

Mr. Meeker called attention to the desirability of adopting a means of controlling the consistency of the plastic masses and cited a case where the dry strength of ball-clay specimens varied 25% due to a 6% difference in water of plasticity.

The Committee agreed that each mass should be worked immediately after drying to the proper consistency to largely eliminate the variable of aging.

Mr. Thiess cited his experiences in filter-pressing a black English ball clay. The lignitic English clay exhibited objectionable segregation as a result of filter-pressing, with the coarse particles packing in the center of the cake and the highly plastic particles toward the outside. Other highly plastic ball clays could be expected to yield similarly unsatisfactory results in filter-pressing. Mr. Thiess reported that removal of water by plaster molds would probably be a useful procedure, although some of the highly plastic Mississippi clays have been observed to require as much as 48 hours to reach a working consistency. Use of a thin filter cloth to prevent softening of the molds with prolonged service was recommended.

Mr. Beam stated that a definite and controlled amount of water should be used in slip preparation to avoid a variable degree of solution of the water-soluble constituents and that the slaking and blunging periods should be standardized. It was pointed out that the sole use of plaster for drying would make it impossible to determine the amount and character of the soluble salts leached out, whereas a procedure to permit analysis of the filtrate was thought to be desirable.

Mr. McCartt proposed the use of a filter press to reach the sticky state, followed by drying on plaster to the plastic working condition. This procedure would yield a filtrate for analysis.

According to Mr. Thiess, the use of identical amounts of water for slip preparation is not practical due to the wide differences between clays, and he felt that a control of the filtrate was not of great importance in bodies for plastic extrusion.

Dr. Russell explained that properties such as soluble-salt content and castability would be discussed separately under "Miscellaneous Properties" and that the main purpose of this discussion was the evolution of a standard procedure for the preparation of plastic specimens. Mr. Beam agreed that no entirely satisfactory solution to the problem of water of preparation had ever been devised, but stated that establishment of a standard high enough to take care of practically all clays would be desirable. An argument for a high upper limit is the convenience of being able to mix the ball clay in a tumbling apparatus while avoiding any grinding of coarse lignite such as would result from ball milling. A recommended method involves slaking of the clay in water overnight followed by completion of the disintegration in a tumbling mill. The thin slip may then be screened through 100-mesh to eliminate the coarse lignite.

Dr. Russell declared that a primary purpose of water standardization would be the insurance of the same opportunity for soluble-salt removal. Thus, it would appear that both the water of preparation and the water of plasticity must be controlled if absolute standardization is desired. As each clay would have a characteristic water of plasticity, the removal of a uniform water content in all cases could only be accomplished by rather tedious trials to determine the water of plasticity and then varying the water of preparation objectively to yield identical removal in all cases. As clays will have different soluble-salt contents, there will be an inevitable variable in the effect upon plastic or casting properties regardless of any standardization in the amount of water removed, so that any such standardization would be of limited value. A practical procedure would be an arbitrary selection of water of preparation and judgment of water of plasticity (possibly with the aid of testing apparatus to evaluate plasticity). A separate sample might then be used for the determination of soluble salts according to a procedure to be selected later. Mr. Geller pointed out that certain variables may be unavoidable in comparing different clays, but that each individual clay could certainly be handled in a standard manner by all operators.

A. L. Johnson reported that the properties of a clay may be changed through contact with plaster molds. New molds produce magnified effects. Plastic properties are generally improved through contact with plaster, whereas dewatering with plaster generally causes the amount of electrolyte required for casting to increase. Base exchange between the plaster and clay is involved, and the slight solubility of the plaster produces an additional effect.

According to Mr. Thiess, the adoption of molds which have been used at least twice would overcome the main contamination caused by loose particles on the surface of a new mold. Dr. Johnson, however, felt that contamination with particles of plaster was less important than the natural exchange effects and recommended that a new mold be tempered until a relatively insoluble skin of calcium silicate is formed.

Mr. McCartt suggested the use of porous ceramic molds to obviate the effects of plaster. Mr. Thiess agreed that this method was entirely feasible and that an additional advantage would be realized through their adaptability to fast drying at higher temperatures.

A novel method suggested by Professor Watts involved the use of 12-inch canvas bags. The bags are made ready for use by boiling them in water to remove the filler and to swell the cotton fibers. The slip is placed in the bags (turned inside out), and the water slowly drains out until the proper consistency of mass is attained. This draining may require from 24 to 72 hours, but it can be hastened by use of a method to apply a continuous squeezing action. Professor Watts stated that he had applied this method successfully even to Mississippi ball clays.

K. E. Stettinius described a unique small filter press which could be used successfully to obtain information on filterability. This apparatus was constructed of 6-inch pipe and steel plates, and a tire pump provided the necessary pressure through a pressure tank.

(2) Plastic Extrusion vs. Hand Wedging; Deairing

Professor J. W. Whittemore stated that the only advantage for hand wedging is the simplicity and cheapness of equipment involved. It was pointed out, however, that hand wedging magnifies the effect of the human element, and examples were cited in which an identical material tested by different operators yielded results as much as 200% above the minimum. Mechanical extrusion eliminates many of the personal factors, but to be most effective must be combined with deairing to eliminate differences due to entrapped air. The use of deairing extrusion methods was recommended as the standard for preparation of test specimens.

Professor Watts counseled that care must be taken not to select any standard method which involves the use of equipment not universally available. Some concern was evidenced by Mr. Meeker over the size of sample

required by deairing machines, but Dr. Speil advised that a small machine designed by Davis Brown of Los Angeles is commercially available at a cost of approximately $150. Mr. Meeker, however, stated that samples even smaller than 5 pounds must often be tested.

Dr. Russell pointed out that the primary aim in this discussion was to select a method of specimen preparation which would yield reliable and duplicable results between different laboratories. Conduct of the tests in laboratories having suitable extrusion equipment will eliminate any such difficulties as those discussed. Eventually, of course, it will become desirable to conduct tests such as those described by Mr. Meeker in laboratories not having deairing equipment, and thus later on it will become necessary to adopt a method involving very simple equipment.

V. J. Roehm felt that, even with deairing equipment, notable differences might result from differences between machines and augers available in several laboratories. E. H. Fischer recommended a method to eliminate this difficulty as well as provide a simple deairing means at greatly reduced cost. He would replace the vacuum pug mills with a ram extrusion method involving no auger. The clay mixture would be shredded to particles somewhat smaller than $^1/_{16}$ inch in diameter and then placed in a steel cylinder, approximately 4 inches in diameter. The cylinder would be constructed with a suitable die and a nozzle housing at one end and a plunger or plate riding on a piston rod which projects through a packing gland at the other end. Following evacuation of the shredded material, it would be compressed and finally extruded free from the usual auger trouble, viz., differential shrinkage.

Dr. Russell stated that this useful but inexpensive equipment could be individually constructed, but suggested the possibility of some equipment manufacturer making it commercially available in view of the large potential market.

(3) Standardization of Moisture Content for Molding; Method of Determination

Dr. Speil called attention to the great effect of molding water content upon various properties such as shrinkage and strength. As each clay has an optimum characteristic water of plasticity value, an attempt should be made to determine and use this amount in the preparation of specimens by the plastic process. The feel method will inevitably lead to marked variations, so that a mechanical method is to be preferred. No mechanical method has been generally accepted, but one useful possibility is the A.S.T.M. method for soils.[2] A layer of plastic clay of controlled volume is spread into a hemispherical cup. A groove is formed with a standard tool, and the cup is rapped a counted number of times until the plastic clay flows together. This method may be used either with a mass which is being worked up plastic or one which is being dried on plaster to reach the desired condition, and the end point is a standard number of raps to cause the clay to just flow together. Dr. Russell explained that the objective is a tangible and reliable means of determining when a plastic mass is in the proper condition for pugging or extrusion.

Professor Watts described the Atterberg test which has long been used. In this test, the plasticity number is assigned as the difference between the amount of water required to produce flow and the amount which will allow the clay to be rolled into threads. This test introduces more of the human equation than the described A.S.T.M. mechanical test. Professor Watts emphasized the need for a mechanical method of control and cited a compilation of ball-clay data to show that otherwise even the best-trained operators will never agree, as each has his own preference in regard to the proper consistency for working.

Dr. Schramm suggested the possible use of a penetrometer test, but was of the opinion that no standard could be set since each clay would have a characteristic penetrability at the optimum working conditions. The usefulness of penetration tests is confined to the control of a particular material on which standardization is desired.

C. M. Dodd proposed the use of a machine developed by the American Refractories Institute for testing cold-set mortars. Possibly this machine could be adopted to reproduce mechanically a given condition of plasticity as controlled by water content. This machine is provided with a cylinder and weighed plunger. Tapping causes the plastic mass to be forced out through a measured slot onto a graduated table. In this case, water would be controlled to yield a condition of standard flow.

Mr. McCartt suggested the possible usefulness of the Sticky Point Tester developed for soils.[3] The standard end point in this case would be the amount of water which will just permit the clay to be rolled under the steel roller of the apparatus without sticking.

Dr. Russell explained that, although it is highly desirable that a single useful mechanical standard be adopted for all clays, possibly no entirely satisfactory method may be available. A mechanical method even with some limitation of usefulness for all clays comparatively would certainly permit much improved control of any one particular clay as handled by various operators.

(4) Drying Procedure; Storage of Test Specimens

The consensus of the Committee regarding drying and storage was reported by V. J. Roehm as follows: After air-drying for 48 hours, the specimens shall be placed in a drier at 110°C. for a period of 60 hours. All specimens for the determination of dried properties shall be transferred directly to a desiccator and stored there until immediately prior to testing to avoid serious differences due to moisture adsorption from the atmosphere. No specimen shall be tested until it has cooled to room temperature, but the period of subsequent storage is not critical for the determination of either dry or fired properties. The specimens to be used for fired determinations may be stored in any normal room atmosphere upon removal from the drier, and any extreme dampness shall be avoided.

The use of infrared lamps as a means of drying to replace conventional drying methods was recommended as a possibility by D. E. Postlewaite. Through its use a much reduced drying period may be permissible even to the possible complete elimination of preliminary air-drying, plus a reduction in time of high-temperature drying.

Mr. Geller preferred a drying procedure in which the specimens are placed in a cold oven followed by bringing the temperature up to 110°C. gradually, while providing adequate ventilation.

Dr. Russell pointed out that the objective of drying is the complete elimination of the water of plasticity under conditions to reduce cracking and warping to a minimum and cited the possible usefulness of a V-trough to alleviate the later tendency. Mr. Meeker recommended the alternative of turning the bars at 4-hour intervals until safely past the warping state and the covering of the specimens overnight when turning cannot be accomplished.

VI. Determination of Drying and Unfired Properties

(1) Rate of Drying

Professor Watts made the following recommendations regarding the determination of rate of drying: Three specimens taken immediately after forming shall be placed on oil papers of standard dimension and weight and then weighed at 3- to 4-hour intervals as drying progresses. The final values for air-drying and high-temperature drying shall be recorded, and the latter will provide a determination of the actual water of plasticity used.

Mr. McCartt pointed out the desirability of humidity

[2] "Liquid Limit of Soils," A.S.T.M. Designation D423–39 adopted in 1939.

[3] L. B. Olmstead, "Some Moisture Relation of Soils from the Erosion Experiment Stations," *U. S. Dept. Agr. Tech. Bull.*, No. 562 (July, 1937), pp. 21–32.

control in any rate of drying determination and recommended as a simple method the use of enclosures containing solutions of selected salts, it being known that each such solution has a characteristic vapor pressure. The use of a saturated solution containing an excess of salt would insure the maintenance of a uniform vapor pressure despite evaporation from the specimens, as the evaporation would be neutralized by the solution of additional salt, thus maintaining an equilibrium condition.

Dr. Russell explained that this very practical method will be most useful for drying at ordinary temperatures, or during the preliminary drying, whereas the effect of humidity during high-temperature drying can best be minimized by the insurance of adequate ventilation. It was pointed out that some rather elaborate driers have been designed to weigh continuously a specimen as it is dried under conditions of controlled temperature and humidity. Possibly these will be used for special tests.

(2) Drying Characteristics: Cracking, Warping, Discoloration

Dr. Russell suggested that the drying characteristics should be analyzed in a manner to assist in the evaluation of any particular clay. The tendency to crack is important and may be determined by visual inspection both during drying and after its completion. An accelerated drying rate may be applied if a more severe test is desired.

Warpage may also be determined visually for all practical purposes, but a test involving actual physical measurements may be applied if a closer evaluation of the tendency to warp is desired. Any unusual discoloration may also be observed by visual inspection of the dried specimens.

(3) Drying Shrinkage (Basis for Calculation); Dry Transverse Strength

Professor Watts emphasized that all shrinkage marks should be placed on the bar specimens immediately after the specimens have been formed. Identifying numbers and letters may be applied at the same time. At least five specimens shall be used and the same specimen may subsequently be fired for the determination of firing shrinkage.

There is much difference of opinion as to whether drying shrinkage and water of plasticity should be calculated on a dry or wet basis. The decision becomes largely arbitrary, but it is highly desirable that the same basis be used in both cases to avoid confusion and that a standard basis be adopted and used universally in all future reports for the literature. This applies not only to the data which it is proposed to report in this project, but to the entire ceramic literature. Only in this manner will the current confusion be avoided and will data carefully obtained assume their real meaning and value.

Dr. Russell presented the idea that in a water of plasticity test the weight of ceramic body itself is basic, and thus a determination on the dry-weight basis is logical. Any attempt to vary the water of plasticity while basing calculations on a wet basis would certainly be confusing. The desirability of keeping shrinkage determinations on the same basis as water of plasticity to avoid confusion thus recommends a drying-shrinkage determination on the dry-length basis. Another point favoring the dry-length basis is its past use in so much of the reported data.

After deliberate consideration of the merits of both methods, the Committee arbitrarily decided to recommend the adoption of the *dry basis* for the determination of both water of plasticity and dry shrinkage.

It was also recommended that dry transverse strength be determined on a minimum of ten bar specimens with the conditions of test being standardized as much as practically possible.

VII. Miscellaneous Discussion

(1) Fellowship Proposal

F. P. Hall made the suggestion that a great many problems incident to the development of this project could be solved by the establishment of a fellowship through the cooperation of industry and the producers of ball clays to develop and conduct many of the tests. Such a fellowship would also obviate many of the difficulties incident to the method of handling and distributing clay samples.

Dr. Russell reported that nothing specific had been developed with regard to the fellowship plan, but that it was being considered as a promising possibility. Whether or not the necessary financial support would be forthcoming has not been determined, as it was believed that complete agreement on the objectives and course of the project must be realized before any such plan for a fellowship could be successfully promoted.

MEMBERS IN SERVICE *

The following members of this Society are in fighting units of war service. There are several in service in Washington not included in this Service Roster. This list, which was begun September, 1942, and added to each succeeding month, is probably not complete, and we would appreciate information on other members.

(247) Leonard J. Bell, Georgetown Clay Products, Ltd., Georgetown, Ontario, Canada.
(248) Cyril Bradwell, 924 Timberman Rd., Columbus, Ohio.
(249) Stephen H. Epsten, Georgia School of Technology, Atlanta, Ga.
(250) Paul E. Grigg, American Porcelain Enamel Co., Muskegon, Mich.
(251) W. C. Hackler, Virginia Polytechnic Institute, Blacksburg, Va.
(252) John R. Humphrey, U. S. Bureau of Mines, Rolla, Mo.
(253) George C. Munroe, Pennsylvania State College, State College, Pa.
(254) William H. Orth, Cambridge Tile & Mfg. Co., Cincinnati, Ohio.
(255) Bernard C. Smith, Carnegie-Illinois Steel Co., Chicago, Ill.
(256) Donald R. Smith, Ironton Fire Brick Co., Ironton, Ohio.

* These are in addition to the lists published monthly, beginning with the September, 1942, *Bulletin*, with the exception of the June, 1943, issue.

SECOND WAR CONFERENCE, APRIL 2, 3, 4, 5, PITTSBURGH, PA.

A MEETING SUGGESTION

December 21, 1943

Dear Ross:

Last year, I agreed to pay the expenses of some of my friends to the Annual Meeting if they did not get their money's worth. I did not have to pay it; every one of them joined.

Members are gained and attendance is increased by an invitation to attend.

We have something good to offer the brick and tile men this year.

We are not crystal-gazing, but we have some practical ideas of the future.

We will have to cut the cost of labor and fuel; this can be done in evolutionary steps.

Every member should invite other brick and tile men.

The nearest way to a brick man's heart is to discuss *making brick* and not some price setup or some "baloney" from Washington. If two brick men will help each other to *produce*, a price or sales agreement is easily established.

Cordially,
L. R. Whitaker,
Carolina Ceramics, Inc.,
Columbia, S. C.

CAN YOU TOP THIS?

With Proper Incentive, Yes!

PAID MEMBERSHIP AND SUBSCRIPTION RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
December 21, 1942	2088	270	15	446	220	3039
February 21, 1943	2095	267	10	451	220	3043
September 21, 1943	2021	295	6	487	220	3029
October 21, 1943	2043	302	6	501	220	3072
November 21, 1943	2076	303	5	507	220	3111
December 21, 1943	2096	309	4	501	220	3130
January 21, 1944	2110	323	4	531	220	3188

President Cecil E. Bales and Membership Chairman Ralston Russell, Jr., Are This Year's "Tops" in Membership Solicitation.

The Incentives Are

I. With Increase in Numbers of Collaborators and With Increase in Financial Means the Members Can (*a*) Produce More, (*b*) Exchange More, and (*c*) Multiply Sources of Information.

II. There Is Honor in Being a Working Associate with Men and Women Who Are Known for Their Accomplishments.

III. The Value of Information Obtained and the Value of Fellowships Realized Is Worth More Than the Small Membership Fee Represents.

IV. One Is More Happy When Sharing in the Cost of Maintaining His Most Productive Source of Information.

NEW MEMBERS IN JANUARY

Corporation

AMERICAN GLASSWARE ASSN., H. L. Dillingham (voter), 19 West 44th St., New York, N. Y.
BRISCH BRICK CO., Michael Brisch, Jr. (voter), 228 N. LaSalle St., Chicago, Ill.
CASE, W. A., & SON MFG. CO., Willard G. Young (voter), Robinson, Ill.
COLUMBIA FIRE BRICK CO., M. L. Hamaker (voter), First National Bank Bldg., Canton, Ohio.
DAVIS FIRE BRICK CO., D. D. Davis (voter), Oak Hill, Ohio.
GOLDSCHEIDER EVERLAST CORP., W. F. Goldscheider (voter), 280 Third St., Trenton 10, N. J.
GRINDLEY ARTWARE MFG. CO., A. K. Grindley (voter), Box 166, Sebring, Ohio.
LOUISVILLE FIRE BRICK WORKS, Louis Ernst (voter), 4554 Louisville Ave., Louisville, Ky.
PADEN CITY POTTERY CO., M. C. Sondles (voter), Paden City, W. Va. (formerly in name of M. C. Sondles, personal member).
PROMAT DIVISION, POOR & CO., A. E. Chester (voter), 851 S. Market St., Waukegan, Ill.
ROOKWOOD POTTERY, H. Leslie Moody (voter), Mt. Adams, Cincinnati 2, Ohio.
*SCHUNDLER, F. E., & CO., INC., C. P. Derleth, Box 1145, Joliet, Ill.
SENECA GLASS CO., William J. Sigwart (voter), Morgantown, W. Va.
UNITED STATES GLASS CO., C. W. Carlson (voter), Tiffin, Ohio.

Personal

*ALLISON, ADRIAN G., 888 Chambers Rd., Columbus 8, Ohio; assistant supervisor, Battelle Memorial Institute.
BAAB, KENNETH A., 231 W. Tenth Ave., Columbus 1, Ohio; research fellow, Ohio State University.
BACON, J. L., Armstrong Cork Co., Millville, N. J.
BENNETT, ALVA H., Spencer Lens Co., 19 Doat St., Buffalo, N. Y.; director of research.
CLAFFEY, LAWRENCE W., 1 S. East Ave., Vineland, N. J.; Kimble Glass Co.
FITZGERALD, VINCENT, 212 Walnut St., Corning, N. Y.; Research and Development Dept., Corning Glass Works.
HUGHES, CHESTER A., 3105 S. Third St., Ironton, Ohio; assistant superintendent, Ironton Fire Brick Co.
JENKINS, HOWARD F., 235 N. Second St., Jeannette, Pa.; chemist, Ro-An Laboratories.
JONES, THOROLD G., K. L. G. Sparking Plugs, Ltd., E. 4, Treforest Trading Estate, near Pontypridd, Glamorganshire, South Wales; technical manager.
PINNEY, J. M., Harker Pottery Co., East Liverpool, Ohio.
RHODES, DANIEL, Box 389, Saratoga, Calif.; ceramist, Permanente Metals Corp.
SADA, PABLO M., Box 44, Piedras Negras, Coah., Mexico; plant manager, La Consolidada, S. A.
SCHMEISSER, CLARENCE E., 2701 S. Seventh St., Ironton, Ohio; superintendent, Ironton Fire Brick Co.
*TREVATHAN, P. EDWARD, Engineering Experiment Sta., Ohio State Univ., Columbus 10, Ohio; ceramic engineer.
TROST, CONRAD, Mellon Institute, Pittsburgh 13, Pa.
WARD, S. PAUL, 605 Mission St., South Pasadena, Calif.

Student

University of Illinois: DONALD W. HAMER.
New York State College of Ceramics: ROBERT B. BURDICK.
Pennsylvania State College: ROBERT M. GRUVER AND FREDERICK E. SNYDER.
University of Texas: QUENTIN E. NELSON.
Virginia Polytechnic Institute: LT. W. C. HACKLER.

* Indicates former member of The Society rejoining.

MEMBERSHIP WORKERS' RECORD

CORPORATION: C. E. Bales 4, Emerson Emrich 1, J. R. Hostetter 1, Ralston Russell, Jr. 1, J. J. Svec 1, D. E. Walsh 1, Office 5.

PERSONAL: A. E. Alexander 1, C. E. Bales 2, R. E. Birch 1, A. R. Blackburn 1, J. F. Greene 1, P. G. Larkin 1, K. C. Lyon 1, Ralston Russell, Jr. 1, H. Z. Schofield 1, A. S. Watts 1, O. J. Whittemore, Jr. 1, Office 4.

STUDENT: R. L. Cook 1, E. C. Henry 2, J. F. McMahon 1, F. K. Pence 1, J. W. Whittemore 1.

GRAND TOTAL: 36.

ROSTER CHANGES FOR JANUARY*

BETZ, GEORGE C., 131 Livingston Ave., New Brunswick, N. J. (Trenton, N. J.)
BOEKER, VICTOR W., Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, Ohio (Edwardsville, Ill.)
CHESNY, H. H., 130 East 75th St., New York, N. Y. (Cape May, N. J.)
DIETRICH, WALDEMAR F., Kaiser Co., Inc., Fontana, Calif. (Sacramento, Calif.)
GRAHAM, ROBERT P., Box 287, Berkeley, Calif. (Lompoc, Calif.)
GROVE, ROBERT L., 4874 N. Port Washington Rd., Milwaukee, Wis. (Derry, Pa.)
HUPPERT, PAUL A., 3663 Belmont St., Bellaire, Ohio (New York, N. Y.)
KNAPP, WILLIAM J., 15 Blake St., Belmont, Mass. (New York, N. Y.)
LEAVY, JOHN C., 64 Netherwood Ave., Plainfield, N. J. (Long Branch, N. J.)
MOSES, SIDNEY A., 2250 Cathedral Ave., N. W., Washington 8, D. C. (Provo, Utah)
ROBITSCHEK, JOSEF M., 1016 Sackett Ave., Cuyahoga Falls, Ohio (Tallmadge, Ohio)
ROTH, H. A., Rundle Mfg. Co., 3905 River Ave., Camden, N. J. (Haddonfield, N. J.)
SCRIBNER, ROGER G., Safety Grinding Wheel Co., Springfield, Ohio (Tiffin, Ohio)
SMITH, DONALD I., Denver Fire Clay Co., Denver, Colo. (Los Angeles, Calif.)

* Address in parentheses is former address.

OPEN LETTER FROM SIDNEY SPEIL TO THE CHAIRMAN OF THE WHITE WARES DIVISION COMMITTEE ON RESEARCH

November 25, 1943

Dr. Ralston Russell, Jr.,
Chairman, Committee on Research,
White Wares Division,
The American Ceramic Society

Dear Dr. Russell:

Your letter of October 21, containing excerpts of letters from Professor Norton and Dr. Johnson and Dr. Hall, is exceedingly interesting to me because I worked for several years under Professor Norton when this fundamental clay study was initiated. There is no doubt in my mind that sooner or later clays will be tailored according to specifications furnished by the consumer. I do not venture to say, however, whether these specifications will be drawn in terms of such properties as dry strength and pore volume of the clay or in terms of particle-size distribution, zeta potential, and total surface of the colloidal micelles.

Before elaborating on this subject in which I am very interested, I should like to answer your specific inquiries.

(1) Yes, the purpose of the ball-clay committee is to standardize methods of testing ball clays. In his letter of October 8, Professor Norton states: "It is very difficult to correlate results from a number of testing laboratories . . . because of the slight variation in technique, due to the personal equation. . . . The most important object of this work is to develop a standard method of testing clays, so that in the future both the producer and the user will be talking the same language." This is the definite target at which the ball-clay committee should aim; if its attention is continually diverted to other objectives, the original program may not succeed.

(2) Symposium III should be arranged for the next Meeting to keep this important problem before The Society, providing the committee is able to show that satisfactory progress has been made since the last Meeting. A definite objective for its work and some definite recommendations should be drawn up by the committee.

(3) After the standardized methods have been tested and adopted, study of the fundamental properties of clays, and of ball clays in particular, would be a desirable and almost necessary objective if further progress is to be made in improving these raw materials.

(4) It might be desirable to appoint a subcommittee to discuss and carry out a program on the fundamental properties of clays; but the main committee should not divert its attention from the primary problem of standardizing ball-clay tests.

(5) As a program for standardization would be advantageous to the industry, it should be supported financially by those who would benefit from it. Before, however, an attempt is made to obtain funds, the aims should be expressed more clearly and definitely so that each company concerned may be able to evaluate what it will gain from the program.

The answers to these questions, especially to items (1) and (4), are based upon the premise that the ball-clay committee is interested primarily in standardizing tests and making the most efficient use of our commercial ball clays. The proposal of Dr. Johnson is worthy of attention and has been advocated recently by many clay investigators. Colloid chemistry principles offer an insight into the mysteries of clay behavior, and therefore the fundamental properties of clay should be studied further from the viewpoint of surface phenomena. The work at the Massachusetts Institute of Technology, in which I had the opportunity to participate, is placing the ceramic properties of clay on a scientific basis as the soil chemist has done for those properties of clay in which he is most interested. This work should be continued until the final objective of clays tailored by various beneficiation processes is attained. But it is not reasonable that a ball-clay committee should sponsor a program the main purpose of which is to reduce the use of commercial ball clays by substituting either highly purified or treated clays without the objectionable qualities of the present product. Perhaps some other committee can be appointed to further this fundamental work and attempt to raise funds to establish a fellowship.

On the same question of tailor-made clays without the dark color of most ball clays, it might be simpler for the present to add plasticizing agents to kaolins, such as the white Texas montmorillonite, which has been used successfully at the Bureau of Mines Electrotechnical Laboratory at Norris, Tenn. This, at least, would be a step toward the goal and would pave the way for the more radical and fundamental clay "fabrication" proposed by Dr. Johnson and others.

Returning to my opening point, I do not know which type of specification the consumer may want to apply to his clays—a fundamental specification or one embodying a simple test, such as strength or pore space. Both have advantages. But as we do not yet know the quantitative effects of these fundamental factors of size distribution and electrokinetic state and cannot yet calculate quantitatively their effect upon a system as complex as that of commercial ball clays, it does not seem that these fundamentals can be used alone by the ultimate consumer. Quantitative correlations will be made soon, but until they are or until we may use tailor-made clays instead of ball clays, practical tests must be employed in addition to any fundamental data on the clay. These practical tests, whatever form they may take, should be the ball-clay committee's primary interest.

—Sidney Speil,
Electrochemical Laboratory,
Bureau of Mines,
Norris, Tennessee

See also *Bull. Amer. Ceram. Soc.*, **23** [1] 25–28 (1944) for open letter from Hewitt Wilson.

PROMOTE AMERICAN CERAMIC DESIGNS

A letter from Walter A. Weldon, Chairman, Design Division

It is unfortunately only too apparent to those of us here in the United States who watch the trends of art movements that a long, slow decline in both active interest and support has been under way for some time. True, in the past, certain art-minded individuals blessed with financial surpluses did on occasion foster and support art activities in their communities. At times, this even spread to the point where such support, both material and spiritual, was on a national scale.

Certain artists, some good and some bad, were in this way able to pursue their artistic devices and at the same time eat at fairly frequent intervals. But who were these artists? They were musicians, painters, sculptors, singers, and so forth, but if such support were ever given to the artists in clay, it has most certainly escaped my notice.

And yet there is no other phase of art which so closely touches everyone as the art of the potter.

I have at times rather tentatively suggested that much might possibly be done to arouse a ceramic art consciousness in the man in the street through the good offices of the Design Division and the Public Relations Committee of The American Ceramic Society. Such suggestions have been quite unofficial and the reception they received somewhat less than ardent. The reason seems to have been that everyone has considered this a job requiring a tremendous amount of time and even possibly huge expenditures far beyond our individual or collective means.

But is it? To answer my own question, I would say definitely not. For example, it would certainly take little time and cost barely more than a 3¢ stamp to ask an American manufacturer of cheese to give credit for the design of his glass container to the actual designer. And why should the soup manufacturer, who gives credit to the institute or person who arranged the setting of the table on which his soup is so appetizingly displayed, hesitate for a moment to give equal credit to the artist who designed the plate.

We can go even farther than that, again without any undue expenditure of either time or money. Many products today are definitely being sold as much on the merits of the package as on the merits of the product itself. When these packages are ceramic, as in the case of our aforementioned cheese manufacturer, why, spurred by us, should he not bring out as a definite selling point the excellence of design with emphasis on its Americanism?

Personally, I am always amazed at the willingness of the great American public to buy tripe and trash both

foreign and domestic, which pretends to a "Mexican" influence or a "Russian" influence and similar alien tags. There is only one reason for it, of course, and that is that other countries have done a better educational job than we have. Imagine, if you will, the ridiculous paradox of the descendants of an Irishman who migrated to America as a protest against absent English lordlings setting their guests down to a dinner served on dishes depicting English castles or the entwined roses of York and Lancaster.

One does not have to be an isolationist or a non-collaborationist or any other "ist" to recognize that there is a way of living that is definitely and distinctively American. Why should that not be expressed in our art as much as in our manufacturing methods? Of course, there is no reason whatever, except the one of public acceptance. And I honestly believe that such acceptance must primarily be fostered, developed, and emphasized by such organizations as ours.

We are the informed leaven on which depends the "leavening of the entire lump," which is the buying habits of our nation.

REFRACTORIES DIVISION RULES CHANGES

Proposed Amendments to Article RR VII Nominations and Elections

The following amendments are proposed for Article RR VII, Nominations and Elections. These amendments will be voted on at the 1944 annual business meeting of the Refractories Division. The proposed changes are necessitated by changes in the parent Society's Rules. It is suggested that all members review the present Rules (*Bull. Amer. Ceram. Soc.*, **17** [10] 399–401 (1938)) before the annual meeting.

Section (1) should be changed to read:

(1) The retiring Chairman of the Division, Division Trustee, and one member appointed by the Division Chairman with the approval of the Division Executive Committee shall constitute the Nominating Committee of the Division.

Section (2) remains unchanged as written:

(2) Any five (5) members of the Refractories Division may place a name or slate of names in nomination by designating such nominations to the Division Chairman in writing, signed by themselves as seconders, and with acceptances of the candidates in writing. The Division Chairman shall transmit the nominations to the General Secretary of The Society according to Article RR VII, Section (4*b*) hereof.

Section (3) shall be changed to read:

(3) The Division Nominating Committee as established in Article RR VII, Section (1) hereof, shall have for its Chairman the retiring Chairman of the Division. This Committee shall nominate a slate of candidates for the offices of Division Chairman, Division Vice-Chairman, and Division Secretary-Treasurer. The Committee shall certify the names of the candidates, together with the acceptances of the candidates, in writing to the Chairman of the Division at least ninety (90) days before the opening date of the next Annual Meeting of The Society, who shall proceed with the election according to Article RR VII, Section (4*b*) hereof. In the event there is no second or other slate placed in nomination, as provided for in Article RR VII, Section (2) hereof, only one slate will appear on the Division ballot. On all Division ballots, however, space shall be provided for the voting member to write in other nominees of his choice.

Section (4):

(4) (*a*) The Division Nominating Committee functioning during the year prior to the Annual Meeting of The Society, at which the triennial term of the Division Trustee representative expires, or when there is an interim vacancy to be filled, shall include on their slate of nominations the name of a candidate for the office of Division Trustee representative. This nominee, together with any other nominations for this office developed according to Article RR VII, Section (2), shall appear on the Division ballot of that year.

(*b*) The Chairman of the Division shall transmit the nominations to the General Secretary of The Society at least seventy (70) days before the opening date of the next Annual Meeting of The Society.

(*c*) Delete.

Section 5(*b*) Remains the same.

—S. F. WALTON, *Chairman, Refractories Division Rules Committee*
C. L. THOMPSON, *Chairman, Refractories Division*

NOMINATIONS FOR 1944–1945

INSTITUTE OF CERAMIC ENGINEERS

For Trustee: HOBART M. KRANER, Research Department, Bethlehem Steel Co., Bethlehem, Pa.

For President: MILTON F. BEECHER, Norton Co., Worcester, Mass.

*For Vice-President:**

T. A. KLINEFELTER, Southern Experiment Station, U. S. Bureau of Mines, Tuscaloosa, Ala.

R. K. HURSH, University of Illinois, Urbana, Ill.

*For Secretary-Treasurer:**

RICHARD S. BRADLEY, A. P. Green Fire Brick Co., Mexico, Mo.

H. N. BAUMANN, JR., Carborundum Co., Niagara Falls, N. Y.

* One to be elected.

ENAMEL DIVISION

Chairman: H. D. CARTER, 3351 Dorchester Rd., Shaker Heights, Ohio.

Vice-Chairman: W. W. HIGGINS, A. O. Smith Corp., Milwaukee, Wis.

Secretary: D. G. MOORE, National Bureau of Standards, Washington, D.C.

Councillor: D. G. BENNETT, University of Illinois, Urbana, Ill.

DESIGN DIVISION

Chairman: WALTER A. WELDON, Locke Insulator Corp., Baltimore, Md.

Vice-Chairman: THEODORE LENCHNER, Vitro Mfg. Co., Pittsburgh, Pa.

Secretary: MYRTLE M. FRENCH, Art Institute of Chicago, Chicago, Ill.

STRUCTURAL CLAY PRODUCTS DIVISION

Chairman: R. L. STONE, Dept. of Ceramic Engineering, Univ. of North Carolina, Raleigh, N. C.

Vice-Chairman: E. F. THEOBALD, Metropolitan Paving Brick Co., Canton, Ohio.

Secretary: V. W. BOEKER, Owens-Corning Fiberglas Corp., Toledo, Ohio.

ATTENTION CAMERA ENTHUSIASTS!

The Ceramic Camera Club will hold its Sixth Annual Exhibit during the Forty-Sixth Annual Meeting of The American Ceramic Society in Pittsburgh April 2–5. The Club earnestly invites any and all members of The Society interested in photography in any of its phases to submit prints, such prints being eligible to compete for the Frazier Award, a coveted and valuable prize. Although the purpose of the Club is to stimulate greater interest in photography of ceramic subjects, an exhibitor may enter prints on any subject.

In addition, Ceramic Camera Club members will compete for first prize and honorable mention on prints entered in the following classification groups: pictorial, portrait, industrial, and scientific.

Prints submitted may be finished and printed by commercial establishments, but the negative must be exposed by the exhibitor.

The Club feels that owing to the keen interest which has been shown in the Exhibit by Society members and friends during past years, the preparation of prints for the coming show should be considered a very worth-while effort.

—V. H. REMINGTON, *Secretary-Treasurer,*
Ceramic Camera Club,
Box 519,
Washington, Pa.

PITTSBURGH SECTION

The first meeting of the new year for the Pittsburgh Section was held January 11 at Mellon Institute.

E. E. Marbaker signed off as retiring chairman and introduced Walter C. Rueckel as chairman for the coming year. Dr. Marbaker, as chairman of the Section and head of the committee in charge of the last annual meeting, has had his hands full for a year which has been very much of a credit to him, and the Local Section and entire national membership owe him a vote of gratitude for his services.

The speaker of the evening was R. R. Shively, vice-president and technical director of B. F. Drakenfeld & Company, Inc., who discussed "The Use of Selenium and Its Compounds in the Ceramic Industry." After a summary of the materials commonly used for producing ceramic colors, the speaker described the use of selenium in the production of red glazes and ruby and pink glasses and in the decolorization of glass and included in his discussion the history of the use of selenium, present production methods, general practice as concerned with quantity, firing conditions, temperature, etc., substitution of other materials in its place, and theories regarding the mechanism by which it functions. A broad coverage of general knowledge on the subject, along with a wealth of personal experience in the field, made this a worth-while meeting.

—J. W. JORDAN, *Secretary*

NEW YORK STATE COLLEGE OF CERAMICS

NEWS ITEMS

Although with a considerably reduced enrollment, the New York State College of Ceramics, Alfred, N. Y., is in normal operation and will continue so throughout the duration.

Graduation exercises were held this year on December 19, at which time the following students received their degrees: Bachelor of Science in Ceramic Engineering, Verle Campbell, Elmer S. Fitzsimmons, David M. Ingham, Fred Kaplowitz, Louis Kelem, Thomas E. Knapp, Richard A. Lowe, D. G. Phillips, John A. Powell, Leo Pozefsky, Maurice Wilson; Glass Technology, Charles M. Rieck, Richard M. Rulon, Kenneth Waldron; Industrial Ceramic Design, Jane Bray, Rhoda Large, Norma Stockwell.

The prize and certificate of award of the Ceramic Association of New York for the best student research thesis was won by Elmer Fitzsimmons and Leo Pozefsky who made a study of the effect of glaze composition on some properties of vitreous china bodies. The commencement address was delivered by Dean Edward Steidle of The Pennsylvania State College, State College, Pa. Following his address, Alfred University conferred upon him the honorary degree of Doctor of Science.

The Student Branch of The American Ceramic Society has been active throughout the fall under the leadership of it president, Maurice Wilson. A meeting was held each month. The speakers were S. F. Walton of the Exolon Company, G. D. Phillips of the Olean Tile Works, and C. E. Bales, President of The Society.

The new officers of the Student Branch for 1944 are T. A. KUPINSKI, *President;* A. POZEFSKY, *Vice-President;* A. SAUNDERS, *Secretary;* and J. BUSCH, *Treasurer.*

Keramos has also carried on its regular program under the leadership of its president, Elmer Fitzsimmons. S. F. Walton was initiated as an honorary member. T. H. Dunkelberger and Leon Bassett were taken in as faculty members and Robert Collin, Alfred Saunders, Ernest Faust, and Hiroshi Nakamura were initiated as student members. On December 17, the annual banquet was held in Hornell. Each student member after making a speech was initiated into the order of St. Patrick by the master of ceremonies, William Crandall. Speeches were then made by members of the faculty and a going-away present was tendered Professor H. G. Schurecht. Keramos intends to carry on the rest of the year although there are only five members on the campus.

Professor Schurecht resigned to accept an offer from the Champion Spark Plug Company. This necessitated considerable shifting of the faculty, announcement of which is made below.

Five members of the faculty are participating in the training of the ASTP cadets, a duty which helps take up the slack resulting from the reduced enrollment of regular students.

Plans for the new $300,000 building are well under way. The Board of Regents has authorized a second additional building for semi-industrial scale work, but the State Planning Commission has not yet approved this additional building. Every indication, however, is that it will be approved and constructed.

Research fellowships are now in operation for the Barium Reduction Company, Briggs Clarifier Corporation, Electro Refractories & Alloys Corporation, Brabender Corporation, North American Cement Corporation, Universal Asbestos Corporation, Edward Orton, Jr., Ceramic Foundation, and the Tile Manufacturing Co.

CHANGES IN STAFF

Dean M. E. Holmes has announced the following changes in the College staff effective February 1, 1944:

Assistant Professor J. F. McMahon has been promoted to the position of professor of research in charge of the experimental work of the Ceramic Experiment Station.

Professor C. R. Amberg has been transferred from the Head of the Department of Ceramic Engineering to the Head of the Department of Research, in which position he will be director of the Ceramic Experiment Station.

Professor R. M. Campbell has been promoted from the position of professor of ceramic technology to the Head of the Department of Ceramic Engineering in charge of all the work leading to the Bachelor of Science degree in that Department.

Charles M. Harder, who has been Acting Head of the Department of Industrial Ceramic Design, is now Head of that Department.

Van Derck Frèchette of the Corning Glass Works has been employed as professor of ceramic technology in charge of petrography, X-ray analysis, and enamelware courses. Dr. Frèchette was graduated from the New York State College of Ceramics in 1939, following which he took graduate work at the University of Illinois, where he received the Ph.D. degree in 1941. Since then he has been employed by the Corning Glass Works.

SALUTE TO SOME OF OUR MEMBERS

JAMES BAILEY

James Bailey was born January 17, 1890, the son of Frank H. Bailey, USN. His father was retired in 1916 with the rank of Rear Admiral. His mother was Anna J. Markham, daughter of early settlers near Dayton, N. Y.

On October 28, 1912, "Jim" married Adele C. Embree of Brooklyn, N. Y. Two children, Alice (1913) and Frank (1920), constitute their family.

James Bailey

Jim was graduated from Lehigh University in mechanical engineering in 1912. At Lehigh, he was a member of Sigma Phi Epsilon and captain of the "Gym" team.

Jim's first employment was with the Corning Glass Works (1912–1929)—two years in the Ceramic Department, one year in the Blowing Room, and from 1915 to 1929 in the Mechanical Development Department.

In 1929, with Don Sharp, he organized the Bailey & Sharp Company, consulting engineers and glass technologists with laboratories in Hamburg, N. Y. With this firm he served as vice-president from 1929 to July, 1937.

In 1937, Jim went to the Hartford-Empire Company, Plax Corporation Division, as vice-president and director of research.

Jim, a Fellow of The American Ceramic Society, was vice-chairman of the Glass Division in 1933 and chairman in 1934. He has served on several committees and as a member of the Glass Division Editorial Committee for several years.

He is a member also of the American Society of Mechanical Engineers, is a licensed practicing engineer in the State of New York, and a member of the Hartford Engineers Club, Hartford, Conn.

Publications

(1) "Variations in Linear Shrinkage of Clay Test Pieces," *Trans. Amer. Ceram. Soc.*, **18**, 557–63 (1916).

(2) "Danner Process of Tube Drawing," *Glass Ind.*, **11** [8] 182–84 (1930).

(3) "Strength of Glass as Affected by Casing," *Jour. Amer. Ceram. Soc.*, **14** [11] 811–19 (1931).

(4) (With D. E. Sharp and Irving Hyman) "Apparatus for Determining the Annealing Constants of Glass," *ibid.*, pp. 820–26.

(5) (With D. E. Sharp) "Physical Tests of Value to the Glassworker," *Glass Ind.*, **12** [9] 179–83 (1931).

(6) "How Many Times Is Your Glass Melted?" *ibid.*, pp. 190–91.

(7) (With D. E. Sharp) "Release of Strain in Glass," *Jour. Amer. Ceram. Soc.*, **16** [8] 367–79 (1933).

(8) "Poor Luze and Richuin" (humorous article), *Inv. Co. Erie Co. Independent*, Jan. 12, 1933.

(9) "Ductile Glass," *Bull. Amer. Ceram. Soc.*, **13** [12] 351 (1934).

(10) "Chemical Durability," *Glass Ind.*, **15** [8] 171–73 (1934).

(11) "Shape, an Important Factor in the Strength of Glass," *ibid.*, **16** [5] 137–41 (1935).

(12) "Problem of Malleable Glass," *Bull. Amer. Ceram. Soc.*, **14** [4] 152–55 (1935).

(13) "Scratch-Resisting Power of Glass and Its Measurement," *Jour. Amer. Ceram. Soc.*, **20** [2] 42–52 (1937).

(14) "Measuring Surface Tension of Glass by Fiber Weight Method," *Jour. Soc. Glass Tech.*, **22** [89] 38–40 (1938).

(15) "Attempt to Correlate Some Tensile-Strength Measurements of Glass," *Glass Ind.*, **20** [1] 21–25; [2] 59–65; [3] 95–99; [4] 143–47 (1939).

(16) "Extruding Polystyrene," *Modern Plastics*, **21** [4] 90–92 (1943).

Patents

(1) "Rotating Lehr and Operation," U. S. 1,416,595, May 16, 1922.

(2) (With D. E. Gray and H. R. Boals) "Apparatus for Shaping Glass Articles," U. S. 1,578,427, March 30, 1926.

(3) "Temperature-Controlling Means," U. S. 1,685,348, Sept. 25, 1928.

(4) "Apparatus for and Process of Finishing Blown-Glass Articles," U. S. 1,685,349, Sept. 25, 1928.

(5) "Finishing Glass Articles," U. S. 1,721,983, July 23, 1929.

(6) "Method and Apparatus for Frosting Glass Articles," U. S. 1,793,893, Feb. 24, 1931.

(7) "Handling Glass Articles," U. S. 1,868,480, July 26, 1932.

(8) "Method and Means for Working Molten Glass," U. S. 1,892,126, Dec. 27, 1932.

(9) "Means for Feeding Molten Glass," U. S. 1,970,354, Aug. 14, 1934.

(10) (With D. E. Sharp) "Heat-Absorbing Glass," U. S. 2,034,994, March 24, 1936.

(11) "Means and Method of Preventing Issuance of Refractory-Contaminated Glass from Feeder Outlets," U. S. 2,050,205, Aug. 4, 1936.

(12) "Means and Method of Controlling Flow of Glass to a Feeder Outlet," U. S. 2,072,807, March 2, 1937.

(13) (With A. K. Lyle) "Window Pane and Method of Making," U. S. 2,121,777, June 28, 1938.

(14) "Means for Thermally Toughening Glass," U. S. 2,144,320, Jan. 17, 1939.

(15) "Apparatus and Method for Preparation and Handling of Plastic Material," U. S. 2,207,426, July 9, 1940.

(16) "Process and Apparatus for Extruding Plastic Sheets," U. S. 2,297,645, Sept. 29, 1942.

ROBERT EDWARDS GOULD

Member, Nominating Committee, White Wares Division

Robert Edwards Gould was born May 20, 1900, at Grand Junction, Colo. He attended grade schools in Denver, Colo., and was graduated from a Cleveland, Ohio, high school in 1918. In 1925, he received the degree of B.Cer.E. from Ohio State University. The professional degree of ceramic engineer was given to him by Ohio State University in 1937.

Robert Edwards Gould

Mr. Gould accepted the position of assistant ceramic engineer for R. Thomas & Sons Co., Lisbon and East Liverpool, Ohio, after his graduation from the University and remained there until June, 1927, when he became chief ceramic engineer for Taylor, Smith & Taylor Co., Chester, W. Va. From June, 1929, until December, 1934, he was general manager of the Giesche Porcelain Factory in Katowice, Poland. In December, 1934, he became chief ceramic engineer for the Tennessee Valley Authority, Norris, Tenn., a position which he held until July 1, 1938. He resigned his position with TVA to accept a position as vice-president and general manager of the Buffalo Pottery Co., Buffalo, N. Y., which position he holds at the present time.

Mr. Gould has been a member of The American Ceramic Society since 1924 and is also a member of the Institute of Ceramic Engineers.

Publications

(1) (With M. G. Toole) "Preliminary Experiments for the Development of a Continuous Electrical Ceramic Kiln for High-Temperature Firing," *Trans. Electrochem. Soc.*, **70,** 111–41 (1936).

(2) (With M. G. Toole) "Progress Report on Tests of Various Electric Heating Elements for Furnace Temperatures Between 1100° and 1500°C., I," *ibid.*, pp. 89–109.

(3) "Progress Report on Occurrence and Refining of Some Tennessee Valley Primary Kaolins": (with A. J. Hedquist and W. B. Boyd), "III, Study of Primary North Carolina Kaolins and Laboratory Experiments in Refining to Produce a Material Suitable for Use in Vitreous Whiteware," *Jour. Amer. Ceram. Soc.*, **20** [6] 178–92 (1937); (with A. J. Hedquist) "IV, Development of a True Porcelain or China-Type Vitreous Dinnerware Body Using American Materials," *ibid.*, pp. 192–96; (with A. J. Hedquist and E. W. Wilson) "V, Casting All-Kaolin Bodies of True Porcelain and China Types," *ibid.*, pp. 197–202; "VI, Plastic Forming of Vitreous Bodies of True Porcelain or China Type, Using American Kaolins as Plastic Constituents, with Notes on a New Method of Manufacturing Straight Flatware," *ibid.*, pp. 202–206; (with A. J. Hedquist) "VII, Experimental Electrical Firing of True Porcelain and China-Type Bodies Made from American Materials for Determination of Suitable Schedule," *ibid.*, pp. 207–14.

(4) "Experimental Determination of Factors Causing Strains in True Hard-Fire Porcelain Flatware and a Practical Means for Elimination in Production." *ibid.*, [12] 389–94.

(5) "What TVA Is Doing in Ceramic Research," *Chem. & Met. Eng.*, **44** [6] 320 (1937).

(6) "Final Progress Report on Plastic Primary North Carolina Kaolins": (with A. J. Hedquist) "I, A Year's Testing of Plastic-Type North Carolina Primary Kaolins," *Jour. Amer. Ceram. Soc.*, **22** [7] 205–207 (1939); (with A. J. Hedquist) "II, Further Development and Testing of a True Porcelain and Vitreous China Dinnerware Body Using North Carolina Kaolin as the Chief Plastic Constituent," *ibid.*, pp. 210–13; (with A. J. Hedquist and E. Wilson) "III, Casting All-Kaolin Bodies," *ibid.*, pp. 214–15; (with G. W. Fichter) "IV, Laboratory Experiments in the Production of Flatware," *ibid.*, pp. 216–19; (with M. G. Toole and M. S. Nelson) "V, Electric Kilns and Furnaces," *ibid.*, pp. 220–37.

(7) "Symposium on Testing and Classification of Ball Clays: Use of Ball Clay in Vitreous Hotel-China Bodies," *Bull. Amer. Ceram. Soc.*, **21** [11] 253–54 (1942).

Patents

(1) "Apparatus for Making Ceramic Articles," U. S. 2,080,418, May 18, 1937.

(2) "Graphite Resistor," U. S. 2,095,977, Oct. 19, 1937.

(3) "Making Ceramic Articles," U. S. 2,173,107, Sept. 19, 1939.

(4) (With D. A. Deaderick) "Forming Ceramic Ware," U. S. 2,221,794, Nov. 19, 1940.

(5) "Making Ceramic Articles," U, S. 2,273,859, Feb. 24, 1942.

EDWARD EARL CALLINAN

Chairman, Papers and Program Committee, Refractories Division

Edward Earl Callinan was born July 1, 1907, in Columbus, Ohio. After attending grade and high schools in Columbus, he entered Ohio State University where he received the degree of B.Cer.E. in 1930. Between college semesters he spent one summer working at the Winslow Glass Co., Columbus, Ohio, and two summers at the Adamston Flat Glass Co., Clarksburg, W. Va.

Following his graduation from the University, Mr. Callinan was employed by the E. J. Lavino & Co., Plymouth Meeting, Pa., where he was in charge of drying, setting, and tunnel-kiln operations at their chrome and magnesite brick plant. In July, 1934, he accepted a position with The Timken Roller Bearing Co., Steel and Tube Division, Canton, Ohio, as refractories engineer. He later became combustion and refractories engineer and is now supervisor of these departments, as well as the Mill Research Department.

Married in 1933 to Kathryn M. Murphy of Norristown, Pa., Mr. Callinan is the father of four daughters.

Professional Degree

Mr. Callinan received the Professional Degree of Ceramic Engineer from Ohio State University in 1940. His

thesis subject was "A Study of Open-Hearth Furnace Design by Use of Area-Temperature-Velocity Flow Diagrams."

Technical Societies

Mr. Callinan has been a member of The American Ceramic Society since 1929. He has previously served the Refractories Division as a member of the Standards Committee (1941–1942) and Program Committee (1942–1943).

He is also a member of the Association of Iron & Steel Engineers (member of the Combustion Division Program Committee), the Institute of Ceramic Engineers, Committee C-8 on Refractories of A.S.T.M., and Alpha Chi Sigma, professional chemical fraternity.

Publications

(1) (With Gilbert Solèr) "Insulation of Open-Hearth Furnaces," *Steel*, **96**, 62–66 (July 11, 1935).

(2) "Pouring-Pit Refractories and Their Effect on Alloy Steel Quality," *Brick & Clay Record*, **88** [6] 229–31 (1936); *Iron Steel Engr.*, **13**, 15–17 (Aug., 1936); *Steel*, **98** (July 13, 1936).

(3) (With Gilbert Solèr) "Symposium on Refractories Testing: Practical Service Testing of Refractories for Alloy Steel Melting," *Bull. Amer. Ceram. Soc.*, **16** [8] 329–34 (1937).

(4) (With E. C. Hite) "Symposium on Steel-Mill Pouring-Pit Refractories: Factors Influencing Pouring Rates of Nozzles," *ibid.*, **18** [3] 80–85 (1939).

(5) (With Gilbert Solèr) "Heating of Steel from Metallurgical Standpoint," *Iron Steel Engr.*, **17** [6] 48–57 (1940).

GORDON SCOTT FULCHER

Member, Glass Division Editorial Committee

Gordon Scott Fulcher was born in Evanston, Ill., March 21, 1884, of parents who were both born in England and grew up there.

His paternal grandfather, Henry Fulcher (1797–1890), was a wholesale wine merchant and distiller in London; he was a widower with eight children when he married Mrs. Maryanne Fairlamb Lofts, a widow with five children.

His father, Edwin Merrett Fulcher (1840–1924), was the fifteenth child in a family of seventeen children; apprenticed as a clerk to a wholesale dry-goods merchant in London on his sixteenth birthday, he did clerical work most of his long life and retired from his position as bookkeeper for a Chicago wholesale dry-goods merchant only two months before his death at the age of eighty-three.

His maternal grandfather, Thomas Scott (1829–1900), was estate manager for Sir Charles Bunbury of Mildenhall, Suffolk; he married Anna Lofts (1831–1868) about 1853.

His mother, Eliza Scott (1857–1938), was the third child in a family of eight children; she was born at Great Barton, Suffolk, and lived there until 1879 when she came to Chicago to marry Edwin Fulcher, who had come to Kansas in 1869, moved to Chicago in 1872, and had met Eliza during a visit to England in 1876.

The family went to South Africa in 1887 and spent five years (1887–1892) in Kimberley; then they returned to Chicago chiefly because Mrs. Fulcher wished her three children to have the advantages of American education.

Gordon Fulcher was educated in the Evanston Township High School (1898–1901); Northwestern University, Evanston, Ill. (1901–1906), B.S. 1905, M.A. 1906; and at Clark University, Worcester, Mass. (1906–1908), Ph.D. 1910.

During his collegiate days he joined Beta Theta Pi, Phi Beta Kappa, Sigma Xi, and later Gamma Alpha.

Choice of Profession

As a boy, Gordon Fulcher was interested in drawing, learned drafting when he was thirteen by attending a night school for foremen, worked in an architect's office each summer during high school, and planned to take a civil engineering course at Armour Institute; then a *Chicago Daily News* scholarship enabled him to attend Northwestern University. He became interested in geology as a result of spending two summers doing field work for the Wisconsin Geological Survey but finally chose physics. A fellowship enabled him to do graduate work in physics under Henry Crew until May 1, 1906, when he went to Worcester to become research assistant to Arthur G. Webster. After a year as instructor in physics at Amherst College, he transferred to the University of Wisconsin to obtain better opportunities to do research; there he completed his Ph.D. thesis on canal rays and, after passing his examination at Clark, went to Europe for the summer. He continued as instructor and later as assistant professor of physics at the University of Wisconsin until 1918. He discovered the band spectrum of hydrogen in 1911.

Gordon Scott Fulcher

War Research and Development Work

Dr. Fulcher spent the summer of 1917 working on the electrostatic properties of balloon fabrics for the Navy and later made a trip to Fort Sill to investigate balloon fires apparently due to electric sparks. He went to Washington March 1, 1918, to join the Science and Research Division of the Signal Corps as experimental engineer under Colonel R. A. Millikan and was put in charge of the development of leakproof gasoline tanks for airplanes; he continued in charge when the work was shifted to the Production Engineering Division of the Bureau of Aircraft Production under Frank Schlesinger. He prepared a complete report before he resigned January 1, 1919.

In World War II, he was appointed consultant to Division One of the National Defense Research Committee in 1942 and is now working on the problem of gun erosion.

Abstracting, Indexing, and Editing Scientific Articles

While at Amherst, he had prepared a "Detailed Bibliography of Canal Rays" giving in concise form all available

information with references. As scientific associate to the National Research Council in 1919–1920, he prepared rules for authors' abstracts of the analytic type and prepared many such abstracts as abstract editor of the *Astrophysical Journal* and of the *Physical Review*. Later, as managing editor of the *Physical Review* (1923–1925), he introduced the practice of distributing to members of the American Physical Society before each meeting programs containing an author's abstract of each paper. He prepared an Analytic Index of volumes 51–54 of the *Astrophysical Journal* to serve as a model for the subject index of *Science Abstracts*. In May, 1924, he was sent as a representative of the National Research Council to attend a meeting at Brussels of the Sub-Committee of Intellectual Cooperation of the League of Nations. This Committee, which included H. A. Lorentz, Madame Curie, Paul Langevin, and other distinguished scientists, recommended unanimously that all articles published by scientific journals be preceded by abstracts and that the rules adopted by the *Physical Review* be followed. When he retired as managing editor, the American Physical Society passed a resolution expressing its appreciation to him "for introducing an abstracting system which has proved a distinct contribution to bibliographic method, and for greatly improving the quality of papers appearing in the *Physical Review*, by an immense amount of detailed editorial work."

Dr. Fulcher served The American Ceramic Society as an abstracter in 1922 and 1923.

Development of Electrocast Refractory Blocks

Dr. Fulcher joined the staff of the Research Laboratory of the Corning Glass Works in 1920, and soon after began work on the electric melting of glass by passing electricity through it. The attack on the flux blocks was very severe, so a search was undertaken for more resistant refractory material. Among the materials tested was fused sillimanite. A small block shaped by laboriously grinding to rectangular form an irregular chunk broken from a mass which had been allowed to cool in the furnace after fusion was found to be extraordinarily resistant. It suddenly occurred to him that if the molten sillimanite were poured into molds, refractory blocks of any desired shape could be obtained which would be far superior to ordinary clay flux blocks in resistance to molten glass. It was soon found that slow cooling of the electrocast blocks was necessary to prevent them from cracking badly and that a composition with only about 22% silica gave stronger and more resistant blocks than the sillimanite or mullite compositions. The value of including 20% or more of zirconia was also soon discovered. After several years of development work which included many service tests, the Corhart Refractories Company was formed to manufacture electrocast refractories, and a factory was built at Louisville, Ky. Production began in 1927. In 1934, Dr. Fulcher went to Louisville as Director of Research. Four years later, after the Research Laboratory had been well established, he retired and moved to Washington, D. C. He has continued, however, to act as consultant.

Design of Physics Exhibits

Early in 1931, Dr. Fulcher was appointed by his former teacher, Henry Crew, chief of the Physics Section of the Division of the Basic Sciences of the Century of Progress Exposition at Chicago. To illustrate the fundamental principles and phenomena of physics, nearly one hundred large, continuously operating exhibits were specially designed and built. Most of these are now in the Museum of Science and Industry at Jackson Park, Chicago.

Social Problems

From his parents, Dr. Fulcher acquired liberal views on political and religious questions and an intense interest in social problems, moral, educational, and economic. After going to live in Washington in 1938, he concentrated on the study of economic problems, beginning with the cause of depressions, about which he had been thinking for some years. This led to an article on "Saving and Underspending" and to his suggestion of a tax on underspending, the principle of which is the same as that of the tax on spending recently advocated by the Treasury to combat inflation. He also made a study of social security. He then became convinced that progress in solving social problems is greatly hindered by the inability of political and other leaders to think soundly. He compiled rules for sound thinking, based on those of John Dewey, and was working on the problem of how college students can be trained to detect errors in thinking and to think soundly themselves when his appointment as consultant to the N.D.R.C. interrupted this work. He hopes to return to this problem after the war.

Memberships

Dr. Fulcher is a Fellow of the American Physical Society, The American Ceramic Society, and the American Association for the Advancement of Science; he is a member of the American Economic Association and former member of the American Optical Society and of the Cosmos Club, Washington, D. C.

Dr. Fulcher married Louise Morgan in 1913. His daughter Anne was born in 1916 and his son John Scott in 1918. He obtained a divorce in 1923 and married Mrs. Hilda Burton Melville in 1931.

PUBLICATIONS

(A) Relating to Physics

(1) "Our Present Knowledge of Canal Rays: A Detailed Bibliography," *Smithsonian Misc. Collections*, **52,** 295–324 (1909).

(2) "Production of Light by Canal Rays" (Ph.D. thesis), *Astrophys. Jour.*, **33,** 28–57 (Jan., 1911).

(3) "Production of Light by Cathode Rays," *ibid.*, **34,** 388–96 (Dec., 1911).

(4) "Stark-Doppler Effect for Hydrogen Canal Rays in Air," *ibid.*, **35,** 101–108 (March, 1912); *Physik. Z.*, **13,** 224–28, 407 (1912) (translation).

(5) "Spectra of Low Potential Discharges in Air and Hydrogen," *Astrophys. Jour.*, **37,** 60–71 (Jan., 1913); *Physik. Z.*, **13,** 1137–42 (1912) (translation).

(6) "Bibliography of Stark-Doppler Effect," *Jahrb. Radioakt. Elektronik*, **10,** 82–91 (Jan., 1913).

(7) "Rutherford Atom," *Science*, **38,** 274–76 (Aug. 22, 1913).

(8) "Suggestion in Connection with Stark-Electric Effect," *ibid.*, **40,** 493–94 (Oct. 2, 1914).

(9) "Method of Determining Whether Velocity of Light Depends upon Velocity of Source," *Phys. Rev.*, **5,** 178 (Feb., 1915) (abstract of paper).

(10) "Presentation of Fundamental Conceptions of Mechanics," *Science*, **41,** 644–47 (April 30, 1915).

(11) "Stark Effect and Atomic Structure," *Astrophys. Jour.*, **41,** 359–72 (June, 1915).

(12) "Can a Body Exert a Force upon Itself?" *Science*, **44,** 747–48 (Nov. 24, 1916).

(13) "Keep Your Eye on the Ball," *ibid.*, **45,** 480 (May 18, 1917).

(14) "Electrostatic Effects on Airships" (report to Bureau of Construction and Repair of Navy Department), *Aeronautics*, **17,** 386–87 (Oct. 23, 1919); also *Aviation*, **7,** 174–76 (Sept. 25, 1919).

(15) "Disruption of Atoms by Alpha Rays," *Science*, **50,** 582–84 (Dec. 26, 1919).

(16) "Excitation of Light by Cathode Rays in Air," *Astrophys. Jour.*, **52,** 278–85 (Dec., 1920).

(17) "Band Lines in Secondary Spectrum of Hydrogen," *Phys. Rev.*, **21,** 585–86 (June, 1923) (abstract).

(18) "Analysis of Recent Measurements of Viscosity of Glasses, I–II," *Jour. Amer. Ceram. Soc.*, **8** [6] 339–55; [12] 789–94 (1925).

(19) "Dunoyer Meniscus Lenses for Use in Spectrographs," *Jour. Optical Soc. Amer.*, **12,** 476 (May, 1926) (abstract).

(20) "Physics Exhibits." Official Catalog of Exhibits in Div. of Basic Sciences, Century of Progress Exposition, pp. 33–52 (1933).

(21) "Grasshopper Problem in Mechanics," *Science*, **95,** 577 (June 5, 1942).

(B) Relating to Abstracting, Indexing, and Editing

(22) "Scientific Abstracting," *Science*, **54**, 291–95 (Sept. 30, 1921); also *Nat. Research Council Reprint*, No. 21.

(23) "Indexing of Scientific Articles," *Nat. Research Council Reprint Circ. Series*, No. 34, 1922; (includes "Analytic Index of Volumes 51–54, 1920 and 1921, Based on the Analytic Abstracts" also published separately by the *Astrophys. Jour.*, 1922).

(24) "Editorial Service," *Science*, **61**, 389–91 (April 10, 1925).

(25) "Authors Abstracts as an Aid to Documentation," *Proc. Annual Conf. Special Libraries and Information Bureaus Assn., 16th Annual Conf.*, Cambridge, England, Nov., 1940.

(26) "Authors Abstracts," *Science*, **91**, 191 (Feb. 23, 1940).

(C) Relating to Electrocast Refractories

(27) "Tank Block Problem Solved at Corning," *Glass Ind.*, **7**, 257–61 (Nov., 1926) (material for this article supplied by Dr. Fulcher; title and text written by Mr. Krak).

(28) "Properties of Cast Refractory Blocks," *ibid.*, **9**, 52–54 (March, 1928).

(D) Relating to Economic Problems

(29) "Price of Prosperity" (privately printed at Evanston, Ill., Dec., 1934).

(30) "Savings, Investment and Prosperity," *Washington Post*, May 23, 1939; in revised form: "A Program for Recovery," *New Republic*, **99**, 161 (June 14, 1939).

(31) "Annual Saving and Underspending of Individuals, 1926–1937," *Rev. Econ. Statistics*, **23**, 28–42 (Feb., 1941).

(32) "Social Security Employment Tax Rates," *Washington Post*, May 9, 1941.

(33) "Fixing Farm Prices and Wages," *ibid.*, Oct. 9, 1941.

(34) "Saving of Individuals in Relation to Income," *Amer. Econ. Rev.*, **32**, 835–40 (Dec., 1942).

(35) "Life Insurance Saving of American Families," *Rev. Econ. Statistics*, **26**, 1944.

(E) Miscellaneous

(36) "Arthur Gordon Webster," *Phys. Rev.*, **21**, 585–86 (1923).

(37) "Proportions of Great Pyramid of Gizeh," *Science*, **71**, 281 (March 14, 1930).

(38) "Use of Printed Practice Sheets and Standardized Test Sheets in Teaching School Subjects," *School and Society*, **32**, 264–65 (Aug. 23, 1930).

U. S PATENTS

(1) (With J. T. Littleton) "Manufacture of Insulators," U. S. 1,543,779, June 30, 1925.

(2) "Cast Refractory Articles and Method of Making," U. S. 1,615,750, Jan. 25, 1927.

(3) "Cast Refractory Product," U. S. 1,615,751, Jan. 25, 1927.

(4) "Making Solid Cast Refractory Articles," U. S. 1,700,288, Jan. 29, 1929.

(5) "Method of Making Composite Refractory Articles," U. S. 1,868,699, July 26, 1932.

(6) "Composite Refractory Articles," U. S. 1,878,839, Sept. 20, 1932.

(7) "Refractory Article and Method of Making," U. S. 1,879,676, Sept. 27, 1932.

(8) "Insulator and Method of Treating," U. S. 1,960,147, May 22, 1934.

(9) "Refractory Cast Block and Method of Producing," U. S. 2,145,113, Jan. 24, 1939.

(10) "Cast Refractory Block and Method of Producing," U. S. 2,201,723, May 21, 1940.

(11) (With T. E. Field) "Refractory Zirconia Casting," U. S. 2,271,367, Jan. 27, 1942.

(12) (With T. E. Field) "Cast Refractory," U. S. 2,271,368, Jan. 27, 1942.

(13) (With T. E. Field) "Refractory Zirconia-Alumina Casting," U. S. 2,271,369, Jan. 27, 1942.

(14) "Cast Refractory Block," U. S. 2,285,026, June 2, 1942.

FREDERICK HURTEN RHEAD *

Founder of the Art Division

By Paul E. Cox

An appreciative review of the skills and talents of Frederick Hurten Rhead which indicates the many experiences artists must gain to be qualified to direct artwork in dinnerware factories.

Frederick H. Rhead founded the Art Division to foster developments in technology and design. In the past, this Society has held some fine exhibitions, and for many years Mr. Rhead directed the gathering of these showings.

Mr. Rhead's interest in avocational ceramics was outstanding, as evidenced by his Ariquipa Pottery work in California, his journal devoted to the studio workers' interests, and his pride in his connection with the American Woman's League in St. Louis in the early part of the century.

Frederick H. Rhead was director of art research at the American Encaustic Tiling Company, Zanesville, Ohio. He had at his disposal an adequate staff, plenty of room, six periodic kilns, and half of a Dressler tunnel kiln, which gave him the equivalent capacity of a factory of twelve large periodic kilns. When a new technique in wall-tile decoration was being developed, it was handled as a research problem. The production crews were trained in the laboratory and all of the production troubles were worked out. When the new product had been approved, the workers were moved out into the plant.

On the floor were ornamented tile, put down loosely to be walked on. The tile were being tested for endurance under wear conditions because the embellishment was rich and the tile should not only be beautiful but durable.

Many pottery pieces served as gifts to board members and architects.

Any well-trained artist will understand the need for a knowledge of the history of art and design and the ability to sketch shapes and decorations of appropriate sort for the age exemplified. Not many ceramists could process and decorate exact reproductions. To do this, Mr. Rhead had to be an unusually skillful potter. In the writer's last chat

* Presented at the Forty-Fifth Annual Meeting, The American Ceramic Society, Inc., Pittsburgh, Pa., April 21, 1943 (Art Division). Received April 21, 1943.

See also "Frederick Hurten Rhead," *Bull. Amer. Ceram. Soc.*, **21** [12] 305–307 (1942).

with Mr. Rhead, he was deploring the fact that his burden of detail prevented him from putting this accumulation of information into printed form.

In Mr. Rhead's office was a large filing cabinet with drawers deep enough to receive three-inch index cards. Every type of clay product made by man had been studied by Mr. Rhead, by visits to museums, books, or by experimentation. When he wanted to make a fine piece of ceramics he had on file the technical information all indexed. The writer has not known anyone with so great a fund of useful information, combined with so many skills and talents.

ABRASIVE COMPANY
PHILADELPHIA, PENNSYLVANIA

Staff of the Glass Research Department, Owens-Corning Fiberglas Corp., Newark, Ohio. This Department is housed in the recently completed Laboratory Center described in the December, 1943, *Bulletin*, pp. 415–16.

Front row (left to right): **Robert G. Russell, Ralph L. Tiede, Fay V. Tooley (Department Head), Albert W. Davison (Laboratory Scientific Director), Howard W. Collins (Assistant Director of Research), August C. Siefert, Luther L. Long, Hendley H. Gregg.**

Back row: **Ronald B. Wiley, David Dingledy, Dwight Stanley, Robert Trout, Virginia Smucker, David Denelsbeck, Esther Herdle, James Cunningham, Oliver Metcalf, John Tims, Robert Shute.**

NECROLOGY

JAMES R. SMITH, SR.*

James R. Smith, Sr., president of the New Jersey Porcelain Company, died November 12, 1943, at his home in Trenton, N. J., at the age of seventy-nine.

Born in England in 1864, he came to this country at the age of nineteen. Here he had his start with the Atlantic Terra Cotta Co., Perth Amboy, N. J. In 1900, he became production manager with the Conkling Armstrong Terra Cotta Co., Philadelphia, Pa. He joined the Trenton Porcelain Company in 1912 as superintendent of their Trenton and New Brunswick, N. J., plants. When the New Jersey Porcelain Company was founded twenty-three years ago, he became associated with them as manager, was elected treasurer in January, 1921, and later rose to the position of president.

He joined The American Ceramic Society as an Associate Member in 1927 and became an Active Member in 1929. At the time of his death, he was also a member of Mercer Lodge, No. 50, F. & A. M.; Trenton Forest No. 4; Tall Cedars of Lebanon; and Knights of Pythias, No. 45, Philadelphia. Until six years ago, he was treasurer of the Slackwood Volunteer Fire Company.

Mr. Smith was the husband of the late Clara Ponting Smith and is survived by a son, James Reese Smith; two daughters, Mrs. Alice Robinson of Philadelphia and Mrs. Irene Ranke of Trenton; a niece, Ida M. Ponting of Trenton; nine grandchildren; and six great-grandchildren.

* From the *Trenton Sunday Times*, November 14, 1943.

GEORGE P. FISHER

George P. Fisher, a member of The American Ceramic Society since 1913, died December 28, 1943.

Mr. Fisher was born in Columbus, Ohio, August 28, 1890, the son of the late Mr. and Mrs. Frank L. Fisher. He has two sisters, both living in Columbus—Miss Dorsie, a high-school teacher, and Miss Ada, a dancing instructor.

He attended the public schools in Columbus, and upon graduating from high school entered Ohio State University, where he was graduated as a ceramic engineer. He immediately accepted employment with the National Fireproofing Company, moving to their Hadenville, Ohio, plant, and later transferring to Hamilton, Ontario.

In 1916, he was transferred to Ottawa, Ill., but entered the service of the U. S. Army during the World War. Upon his discharge from service, he returned to Ottawa in the employ of the National Fireproofing Company, where he became general manager of the Pioneer and Twin Bluff plants and also had under his supervision the plants at Hobart and Brazil, Ind.

In 1932, he became associated with the Ottawa Asphalt Company as sales manager, which position he held at the time of his death.

He was a member of the Illinois Society of Engineers, the Knights Templars, Masons, and Elks.

He was a prominent citizen in civic affairs in Ottawa and was a member of the Ottawa Zoning Commission.

Mr. Fisher was united in marriage October 4, 1921, to Miss Dorothy Refior, daughter of the late David Refior and Mrs. Cora Refior of Ottawa, Ill.

He is survived by his widow and daughter, Janet, a senior student at Ottawa High School.

SAMUEL GEIJSBEEK

Another charter member of this Society has passed away. He died December 6, 1943.

Sam was broadly informed on the practical technology of clayware production. He reproduced for Owens without much trial the brown underglaze decorated artware made first by Miss McLaughlin in Cincinnati and perfected commercially by Stanley G. Burt at Rookwood Pottery. He perfected colored stoneware glazes for Sherwood, and he equipped and operated a vitrified dinnerware plant of his own in Denver. He developed terra-cotta ware and produced refractories to quality specifications. He successfully enameled brick in all desired colors at low production loss. He knew considerable about kiln firing with all sorts of fuels. In things technical, Samuel Geijsbeek was a well-informed ceramist.

Samuel Geijsbeek was a genial fellow and liberal to a fault. He could not believe that any person would take advantage of his liberality. He would not protect his own interests but would give freely and wholly of his talents and trust. Many there are who have reason to be grateful to him.

Biography

Samuel Geijsbeek was born in Holland, attended grade and high school in Arnhem, Holland, and received his technical education at the Royal Technical University, Berlin, Germany, and at Ohio State University, Columbus, Ohio. While taking the chemical ceramic course in Berlin, he obtained practical experience at the Royal Porcelain plant in Berlin under Hermann A. Seger.

After graduating from Ohio State University (two-year short industrial course) in 1896, Mr. Geijsbeek became superintendent of the J. B. Owens Pottery Co., Zanesville, Ohio, and two years later joined Sherwood Brothers, New Brighton, Pa., as assistant superintendent and chemist.

In 1900, he became secretary and manager of the Geijsbeek Pottery Co., Golden, Colo., where he made the first whiteware west of the Mississippi River from Colorado clays and feldspars. From 1903 to 1906, he was assistant superintendent and chemist for the Winkle Terra Cotta Co., St. Louis, Mo.

In 1906, Mr. Geijsbeek became associated with the Denny-Renton Clay & Coal Co., Seattle, Wash., where, as general superintendent, he made the first commercial terra cotta in the Pacific Northwest. Leaving this Company in 1907, he organized the Northern Clay Co., Auburn, Wash., and remained there as secretary and manager until 1910, when he opened an engineering office in Seattle, Wash., under the name of the Geisjbeek Engineering Company. He was manager of this Company from 1910 until 1921, at which time he returned to the Denny-Renton Co., Seattle, Wash., as manager of the Terra Cotta Department. From 1927 to 1930, he was sales manager of the Refractories Department of the Gladding, McBean & Co., Seattle, Wash.

In 1930, he returned to his former position as manager of the Geijsbeek Engineering Company and remained there until August, 1938, when he joined the staff of the Arketex Ceramic Corp., Brazil, Ind. Here he worked as consultant for three months and as superintendent of factory No. 3 for nine months.

He returned to the Geijsbeek Engineering Company in September, 1939, and remained there until his retirement about a year later.

Samuel Geijsbeek

Mr. Geijsbeek served as a member of the Jury of Awards for the Ceramic Section at the Louisiana Purchase Exposition in St. Louis, Mo., in 1904. He had been a licensed engineer in the State of Oregon since 1919.

He was a charter member of The American Ceramic Society and a charter Fellow. He served as vice-president of The Society in 1906 and 1907. He was affiliated with the White Wares Division and was a member of the Institute of Ceramic Engineers.

Mr. Geijsbeek is survived by two sons, Samuel Geijsbeek, Kent, Wash., with whom he had been making his home, and William R. Geijsbeek of Seattle, Wash.; two sisters, Mrs. Ben Lane of Manzanita, Oreg., and Miss E. J. Geijsbeek, Laguna Beach, Calif.; two brothers, E. J. and J. B. Molenaar of California; and six grandchildren.

Publications

Mr. Geijsbeek contributed fourteen papers to the *Transactions of The American Ceramic Society* (see opposite page). He was also the author of articles which appeared in several leading clay periodicals.

Geijsbeek Papers in *Trans. Amer. Ceram. Soc.*

(1) "Red Glazes at High Temperatures," **1,** 62–68 (1899).
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(14) "Clay Deposits of Oregon," *ibid.*, pp. 644–58.

For Ceramists Individually and Collectively
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On Postwar Opportunities

April 2, 3, 4, and 5, 1944, Hotel William Penn, Pittsburgh, Pennsylvania

A NEW word has been coined: SYNERGISM, from the Greek word ***syn*** meaning ***with*** or ***joining together*** and ***erg,*** which is used in the science of physics to mean a unit of energy. You know this product, ***synergism,*** well—even though no one has ever named it before. When capable open-minded people get together on a project they seem to achieve something a little better than the sum of their joint efforts might forecast.

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DETERMINATION OF DENSITY BY THE FLOTATION METHOD*

By T. C. Vaughan

Abstract

A flotation method for the determination of density, which is particularly suitable for measurements on small samples, is described. The density of a mixture of xylene and acetylene-tetrabromide is adjusted so that the sample suspended in the mixture shows no appreciable vertical motion in a reasonable length of time. The density of the liquid is then determined by the method of Archimedes, using an accurately calibrated standard. Details of the procedure for calibrating the standard and for adjusting the density of the liquid mixture are given.

Measurements are made at room temperature without the use of special equipment. No temperature correction is necessary if the standard chosen has approximately the same coefficient of expansion as the material under investigation. Measurements made at various temperatures are automatically corrected to a common temperature by using a fixed value for the density of the standard.

I. Introduction

The methods commonly employed for measuring density are (1) the volumetric method, (2) the method of Archimedes, (3) the pycnometric method, and (4) the flotation method. The volumetric method, in which the volume is determined from the dimensions of the sample, is useful mainly for rough approximations. The pycnometric method and the method of Archimedes are used extensively, and details and refinements of these procedures are available in the literature and in textbooks.

The flotation method, in which the density of a buoyant liquid is adjusted to match the density of the sample, is well known in principle and has been used for some very precise work, but the details of procedure are not readily available. The method has been found particularly well suited to the measurement of small samples of glass, for which purpose the procedure here described was developed.

II. General Considerations

The essential equipment for making flotation density measurements includes two miscible liquids, one having a density greater and the other less than that of the sample, and a standard density piece whose density is somewhat greater than that of the sample to be measured.

Of the several heavy liquids available, acetylene-tetrabromide is quite generally used because of its stability and wide range of applicability. It has a density of about three gm. per cc.

The choice of a light liquid to be used with acetylene-tetrabromide is subject to wide variation. Acetone was used by Morey and Merwin.[1] Isopropyl-salicylate was chosen by Turnbull[2] because its vapor pressure just about matched that of acetylene-tetrabromide. For the method here described, xylene was chosen because it shows little loss by evaporation as compared with acetone and does not foam as does isopropyl-salicylate when mixed with acetylene-tetrabromide.

The standard density piece must have a density somewhat greater than that of the sample and preferably should have about the same thermal expansion. A block of dense barium crown optical glass having a density of about 3.5 gm. per cc. and weighing about 20 gm. makes an excellent standard. Calibration of the standard is described under the detailed procedure in Section III.

III. Procedure

(1) Equipment

(1) An analytical balance; (2) a wire basket for holding the standard; (3) a fine platinum wire 0.0026 in. in diameter for suspension of the sample; (4) a density standard; (5) xylene (technical quality); and (6) acetylene-tetrabromide (technical quality).

(2) Calibration of Standard

Prepare a nearly cubical piece of dense barium crown optical glass (density about 3.5, weight 20 to 25 gm.) by grinding the surfaces smooth and rounding edges and corners to minimize chipping. If possible, the piece should be polished.

Weigh the standard to tenths of a milligram and record as weight in air. Partly fill a 400-ml. beaker with gas-free distilled water. Place the beaker on the specific-gravity table over the left-hand pan of the balance. Suspend the wire basket in the beaker of water so that only the fine platinum suspension wire cuts the surface of the water. Weigh to tenths of a milligram. Record the weight of the basket in water. Place the standard in the basket, and record the weight of the basket and the standard in water. Record the temperature of the water to tenths of a degree. Repeat this procedure at several temperatures, making certain that the standard and the water are at the same temperature. The difference between the weight of the basket and standard and the weight of the basket is the weight of the standard in water at the temperature indicated.

From the data obtained, plot the weights against the temperatures and draw the best straight line connecting

* Presented at the Forty-Fifth Annual Meeting, The American Ceramic Society, Inc., Pittsburgh, Pa., April 21, 1943 (Glass Division). Received July 23, 1943.

[1] G. W. Morey and H. E. Merwin, "Relation Between the Composition and Density and Optical Properties of Glass: I, Soda-Lime-Silica Glasses," *Jour. Optical Soc. Amer.*, **22**, 632–62 (1932); *Ceram. Abs.*, **12** [6] 218 (1933).

[2] J. C. Turnbull, "Separation of Inhomogeneities in Bottle Glass by Density Differences," *Jour. Amer. Ceram. Soc.*, **24** [2] 37–43 (1941).

the points. Determine from the line the weight of the standard in water at 25°C.

Calculate the density of the standard at 25°C. as indicated in the following sample calculation:

Weight in air	21.6214
Weight in water at 25°C.	15.5992
Loss of weight in water	6.0222
Divide weight in air	21.6214
by loss of weight in water	6.0222
Specific gravity at 25°C.	3.5903
Multiply specific gravity at 25°C.	3.5903
by density of water at 25°C.	0.99704
Density of standard at 25°C.	3.5797

(3) Manipulation

The acetylene-tetrabromide and xylene should be kept in the room in which the measurements are to be made to insure having them at room temperature during the measurement. The temperature of the room should remain practically constant, and the measurement should be made in a location free from draughts to avoid upsetting the equilibrium between the liquid and the sample during the final adjustment.

For the sample, prepare a small piece of glass that is free of cracks and bubbles. A chip weighing between 20 and 40 mgm. is quite suitable, although much larger samples may be used if available.

Place the sample in a 250-ml. beaker containing about 100 ml. of a mixture of xylene and acetylene-tetrabromide. (A mixture of the two liquids left over from a previous test may be used.) If the chip sinks, add acetylene-tetrabromide slowly with thorough stirring until the sample is brought to the surface. Continue to add xylene or acetylene-tetrabromide as needed to keep the density of the liquid approximately balanced with that of the sample until the beaker is about three-fourths full. When the beaker contains sufficient liquid to allow the standard and basket to be completely submerged, carefully adjust the density by adding the appropriate liquid dropwise. The density of the binary mixture is considered to be balanced with that of the chip when the chip remains suspended without appreciable vertical motion for 4 or 5 minutes.

The following operations should be carried out and recorded as indicated on the following sample data sheet. The numbers in the left-hand column indicate the order of the operation.

(1)	Weight of standard in air	_____
(5)	Weight of standard in liquid (4)	_____
(6)	Loss of weight in liquid	_____
(2)	Weight of standard and basket in liquid	_____
(3)	Weight of basket in liquid	_____
(4)	Weight of standard in liquid	_____
(7)	Multiply (loss of weight in liquid)	_____
	by density of standard at 25°C.	_____
(8)	Divide product	_____
	by (weight of standard in air)	_____
	to obtain density of liquid at 25°C.	_____

The density of the liquid at 25°C. equals the density of the sample at 25°C.

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IV. Results

Measurements made on three different glasses over a range of temperature from 20° to 30°C. are listed in Table I. The temperature of the room was slowly increased while making the measurements, with a consequent increase in the temperature of the liquid. The temperature was measured to the nearest 0.1°C. The density was determined at each temperature, using the density of the standard at 25°C. The maximum deviation from the average is ±0.0004 gm. per cc. The three glasses differed in chemical composition and physical properties. Glass A is a high-silica low-alkali glass having a linear coefficient of thermal expansion of 82.4×10^{-7}. Glass B is a typical container glass having a linear coefficient of expansion of 91.5×10^{-7}. Glass C is a borosilicate crown glass.

TABLE I

DENSITY VALUES AT 25°C.

Glass	Sample wt. (gm.)	Temp. (°C.)	Density at 25°C.	Avg.	Max. deviation
A	0.024	23.5	2.4412		
		25.8	2.4413		
		26.6	2.4406		
		27.2	2.4413		
		27.5	2.4410	2.4410	±0.0004
		27.6	2.4409		
		27.7	2.4410		
		29.5	2.4412		
		31.0	2.4408		
B	0.036	21.2	2.4686		
		22.6	2.4686		
		23.7	2.4688	2.4686	±0.0003
		25.3	2.4687		
		26.8	2.4683		
		28.4	2.4688		
C	0.021	23.9	2.5227		
		25.4	2.5227		
		25.6	2.5223		
		26.5	2.5225		
		26.6	2.5227		
		27.7	2.5228	2.5225	±0.0004
		28.0	2.5225		
		28.8	2.5222		
		29.0	2.5223		
		30.0	2.5226		
		30.2	2.5221		

The method has been used to determine differences in density of samples taken from various parts of the same bottle and for identifying small pieces of glass reported to be from a given jar or bottle. The method is used for measurements on seedy or blistery glass when only small samples of seed-free glass are available. Its use may be extended to the determination of odd minerals sometimes found in raw materials.

For the comparison of isolated samples, the accuracy of the method is certain to the third decimal place. If conditions permit direct comparison of two samples, the fourth-place figures may be relied upon.

Acknowledgment

Much of the preliminary work on this procedure was done by A. M. Hillery, Jr., formerly of this laboratory and now in the armed forces.

RESEARCH LABORATORIES
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FIFTY YEARS OF DECORATIVE AND TABLE GLASSWARE*

By Marvin G. Yutzey

Abstract

A review is given of successful style trends in the past fifty years as experienced by a leading decorative and table glassware manufacturer. The probable reasons for the success of each are discussed. A designer's viewpoint on postwar planning and a glance into the future are presented.

I. Introduction

In reviewing the most popular and successful types or styles of decorative and table glassware over a period of fifty years, one is tempted many times to consider particular items that were phenomenal sellers for no other apparent reason than that they were good novelties which happened to click. These items, however, indicate little significant of the time in which they were successful and give no sound basis of experience on which to plan for future goods.

The determination of definite concrete reasons for the outstanding success of certain types of glassware is a highly complex procedure. There are numerous factors to be considered, many of which are beyond the direct control of the manufacturer. It is true, however, that some things become great money-makers almost solely because of smart promotional methods, high-powered advertising, and widespread distribution. Although good advertising and promotion are fine arts in themselves, designers and planners prefer to consider factors of more genuine importance in the determination of style, viz., the general trend in home furnishings of the time, current customs of entertaining, money available for these goods, the general condition of the market, and the development of new processes of manufacture.

This study is fact-finding to a degree, but some of it must be guesswork. Some thinking about past experience governs future planning. Too great a change from past experience will shock the buying public. The past shows that persons cannot be frightened, forced, or shocked into buying something too radically new.

II. Style Trends

No definite line of demarcation appears to exist between each of the four major style trends of the past fifty years. The slow growth and development in each style overlapped to a great degree the preceding and subsequent ones.

Probably one of the biggest volume items of the early part of this fifty-year period was the extremely useful and highly decorative oil lamp. By 1895, there were at least five important manufacturers of these lamps. The market was highly competitive, but there was enough business so that each company experienced a phenomenal volume of sales. In some of the factories, half of the production was of oil lamps.

There were at least two definite types of lamp made, (1) predominantly functional and (2) overwhelmingly decorative. The fact that relatively few homes were wired for electric light even though the incandescent electric lamp was made commercially successful as early as 1879 accounts for the outstanding volume for purely functional reasons. There was a great demand for decoration as it was understood at the time. Home furnishings, generally speaking, were predominantly Victorian in character. The general temperament of the people demanded highly decorated things with a maximum of show and sentiment. Decoration was something applied; flowers, sentimental landscapes, hunting scenes, and more flowers were therefore plastered on oil lamps which sold like "hot cakes." Every Victorian parlor had to have at least one big, beautiful oil lamp. Sales of both the functional and decorative oil lamps continued into the early 1900's.

Paralleling this period but reaching its peak somewhat later was a huge demand for heavy imitation cut dinnerware and decorative pieces. Heavy blown lead crystal with deep ornate mitre cuttings had attracted much attention at the Chicago World's Fair in 1892. By 1900, several patterns of pressed glassware inspired by this genuine cut blown ware were on the market. Pressing the patterns in the glass made a more popular-priced imitation of this flashy merchandise. Many times these pressed blanks were cut over; this process, of course, produced a closer imitation of the original and was much less expensive.

This type of glassware reached its peak between 1910 and 1912 and accounted for a major part of the volume of production of some glasshouses. It had a successful life of sixteen or seventeen years at a time when the desire for flashy glitter was much in demand. Desire for show probably had much to do with the success of this type of ware. It was functional to a degree but was exceedingly hard to clean.

During the same period, the process of deep etching of glass was introduced. In 1904, deep etching was entirely new to this country although it is believed that some of this work had previously been done in England. This technique lent itself beautifully to the production of intricate grape patterns. All the tendrils and delicate vines of the grape could be reproduced on stemware and flatware with great fidelity. It is unlikely, however, that the process popularized the pattern, as the vintage patterns were very much in evidence at this time in wall paper, drapery fabrics, and general decorative household accessories. At any rate, great volumes of etched vintage-pattern glassware were sold.

About this time, there was also a ready sale for hand-blown jugs and bar glassware. Monogrammed tumblers and stemware for hotels and railroads also produced a good staple business until the development of the machine-made merchandise.

About 1910, iridescent glassware and silver-deposit novelties were introduced. The silver-deposit ware en-

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joyed a relatively short but exceedingly successful career, reaching its peak in 1912 and dying out in 1915 when untarnishable silver was introduced. Applied fired iridescent ware, however, continued at a moderate sale until 1924. These more or less loose ends, however, are not indicative of the real style trend, if there was any at all between 1914 and 1920. What probably is most significant during this period is the definite initial reaction to the Victorian trend as indicated by the great sale of simple Colonial types of glassware. The imitation heavy cut ware was definitely out.

Most people bought the patterns consisting of little more than a passable silhouette, utility value, and ease of cleaning as compared to the flashy heavy cut ware. Essentially the ware was attractive enough but it seems likely that there was somewhat less desire for show with comparatively little entertaining as we find it later; it may also be that this period dominated by the first World War was primarily a transitional period. There is little that is particularly outstanding or indicative unless it is the break from the Victorian to a simpler style.

After the close of the war, however, beginning about 1920 and continuing for the following ten years to 1930, a great return of color was experienced. This was probably about the third color cycle in the history of American glassware. Some factories in the handmade glassware field made nothing but colors; there were times when there would not be a pot of crystal in the furnaces.

During this period shapes of glassware were further simplified to a degree never known before. Most successful patterns were utterly plain with round or oval shapes, the glass wall being uniform and just thick enough to permit a fine lustrous fire polish. Undulations of the glass wall were used in some patterns to produce an optic effect which increased and decreased the depth of color in the piece. Much of this ware was sold perfectly plain. Customers took great pride in being able to set an entire dinner table with one color. There were many colors to choose from, but some were outstanding successes. Colors were for the most part clear jewel-like colors and tended to be heavy at the first part of the cycle and to fade out in later years to approach some of the tints that we know today.

There was also a great demand for these lines of colored glass in numerous etched designs. These designs ran from formal bands to all-over patterns of floral decoration.

In about the middle of this period (roughly in 1925) a nicer type of pressed stem with a blown bowl found ready acceptance. This process permitted the making of two-color stemware. Much of this stemware was sold during the latter half of the color cycle of the twenties. The stem might be colored glass and the bowl crystal or vice versa. Much of this stemware was etched in patterns to match the dinnerware.

There are probably several good reasons for the return of interest in color in the twenties. The war was over; color may have provided part of the emotional release characteristic of the period. Money was comparatively plentiful, and people were interested in more than just one set of dishes to eat from now that they realized they could have different themes and different colors for different occasions. Interest in entertaining was increasing along with desire for show or display. It was only logical that the character of the times be reflected in colored glass.

The encouraging thing about this period was that the germ of understanding materials and their inherent beauties without the addition of applied decoration was beginning to take root; today appreciation of the pure liquid beauty of flawless unadorned glass is not yet complete.

When colors began to fade, there was already on the way a revival of interest in Early American and Colonial furnishings. While there was a reasonable sale of the simplified Colonial adaptations during the 1914 to 1920 period, they were completely submerged by the wave of color of the twenties. It is reasonable to believe that actually there has been a steady growth in popularity of the Early American and Colonial styles because as soon as the demand for color waned these Colonial adaptations caught on and have skyrocketed to an unbelievable degree ever since.

This revival was first noticed about 1934 when sales of the American pattern began to increase at a great rate. In 1938 another Colonial adaptation was placed on the market. This pattern had been made and had enjoyed reasonable success as far back as the 1890's. With the addition of new pieces with fresher silhouettes in 1938, however, it immediately caught on and has gained in sales each season.

The present war period parallels in many respects the period from 1914 to 1920. Most of the industry is working to capacity in an effort to give reasonable delivery on established lines with little effort to bring out new merchandise. Since the war began, nothing strikingly new or indicative of what we might expect after the war has been placed on the market.

Salespeople in china and glass departments of the war production areas tell us that the increase of money in circulation and the lack of much consumer goods on the market have caused a great influx of business, particularly in the better types of ware. These customers, in many cases, have more money now than they have ever had before, and their only consideration in buying china or glassware is to get something fine. Their tastes are easily influenced, however, by well-informed salespeople; there is an excellent opportunity here for a good educational program in the use of fine china and glassware in modern living.

III. Future Prospects

Although manufacturers are converted from production of consumer goods to war production or are busy making delivery on established and proved lines, they also have their eye on the future. It is known that designing and engineering departments are thinking about postwar business and are even developing things which normally would appear in new models from year to year.

In considering the idea of postwar planning one is immediately confronted with the question of how long the war will last. There are two possible answers to this question and therefore two probable directions which postwar planning could take. In the event of a short war, it is probable that when peace comes there will be a period of business as usual, with a more normal trend in design than if the war lasts much longer. In a prolonged war the natural reaction is usually greater and might well be reflected in consumer goods.

(1944)

In either event it is reasonable to assume that there will be a short period of readjustment to peacetime production. There will, no doubt, be a drastic shortage of consumer goods. While new dies and molds are being prepared for peacetime business, the 1941 or 1942 model dies and molds will have to be used to carry on.

It is fairly certain that the conversion of expanded industrial production will go toward the establishment of new industries using new materials and new developments born during the war. The advent of prefabricated housing and civilian use of the helicopter are only two of the probable new industries that will influence the pattern of life and the things to buy. It is possible that the prefabricated housing industry alone may far surpass the automobile industry in the future. There is a serious shortage of adequate housing and present methods of building are not in step with today. In considering the housing situation in the postwar period it will be necessary to budget less income for shelter than at present. The general opinion of most people is that one-fourth of the income is excessive for housing and that one-seventh will approximate a more reasonable figure. Prefabricated housing can make this possible.

The question of civilian needs after the war will be influenced greatly by the demands of the young men returning from battle to marry, establish homes, and adjust to peacetime living. Here again is divided opinion as to what these men will expect in their homes. They may want their homes to be well-planned and efficient machines because of their association with the cold efficiency of airplanes and other weapons of war, or they may be so fed up with these highly planned things that they will be glad to relax, take their shoes off, and go back to the rocking chair and more sentimental things that they knew in their childhood.

Women will probably continue to do the buying in home furnishings but here again is the same situation. Many of these women are working in war industries where they are constantly coming in contact with good planning, efficiency, and unsentimental things. If their homes are already established, they are directly influenced by the lack of time to devote to them; the lack of help in the home is the direct result of the servant class going into industry from which it probably will not return. The younger women, therefore, who have not as yet established their homes, will want them to be attractive and yet planned for efficient use and care. There is a possibility that women will want frills and fluff in their clothing, if and when they leave the slacks and uniforms of the factory. In regard to furnishings for their homes, however, there is a definite trend toward simplification and an increasing demand that they can be cared for more easily.

It is pretty well assured that there will be little regard for traditional period styles. This does not mean that there will be an utter lack of sentiment in the new homes nor that all prefabricated houses will look alike. Even though the houses will consist of standardized interlocking panels and units, there will be an extremely wide range of possibilities for variety by the addition of prefabricated door details, bay windows, and other factors that give a home individuality.

All this discussion may seem to indicate that modern design is finally coming into its own. There is, however, a decided stigma attached to the word "modern" because in the minds of most people it is still associated with the 1929 modernistic trend or anything in the meantime that was shockingly different. Designers should have learned by now that anything which shocks or frightens the buying public will most certainly not sell in the home-furnishings field. The unfolding of a modern or contemporary style will, under normal conditions, be a steady growth and development out of the spirit of the time. It cannot be emphasized too strongly that the first requisite for a design should be that it is good-looking and attractive to the people who will buy it. Little attention to whether the design can be pigeonholed as modern or 18th century or otherwise is necessary. The great majority of the market does not know a lot about period styles anyway and cares less whether it is style correct so long as it is good-looking and attractive. Most people will continue to like more or less conservatively fine, if not mere ordinary, things to live with. Furniture will gradually lose its intricate carvings and decoration as people begin to realize that their time and energy can be conserved by the use of simpler, cleaner surfaces. They will also begin to recognize the inherent beauty in new materials as well as old and that objects made of these materials can be attractive without the addition of applied, or rather "stuck on," decoration.

The contemporary style must be a moving thing. That style is in a state of flux and movement just as surely as everything else is. No one can possibly pretend to know the real answer. Some designers are bound to make mistakes, but they will have their feet on the ground and profit by their mistakes.

Something very good for the decorative and table-glass industry must come out of these troubled times if manufacturers keep their fingers on the galloping pulse of the public and interpret its needs and tastes correctly.

Fostoria Glass Company
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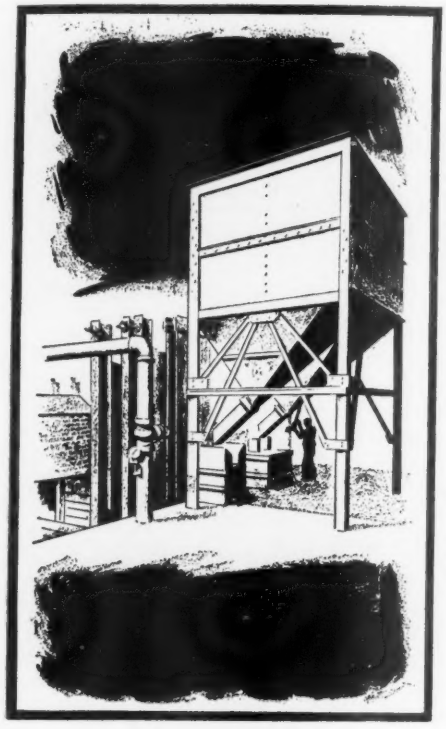
CANADIAN CERAMIC SOCIETY

The Canadian Ceramic Society held a well-attended dinner meeting December 10, 1943. W. A. Irvine of the Canadian General Electric Co., Ltd., gave a splendid address on "Postwar Planning." At this same time, the Society presented President J. Gordon Phillips with an "Ecanada"-design ceramic lamp on the occasion of his marriage. The lamp was made by George Emery.

—Gordon C. Keith, *Secretary*



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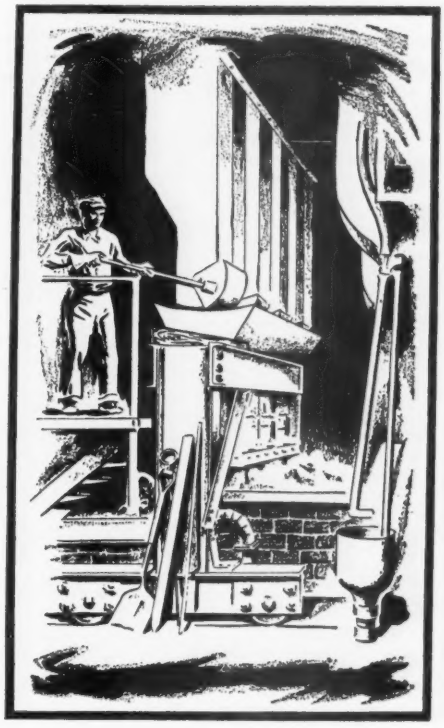

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The Vitro Mfg. Co.

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Antimony Sulphide
Foote Mineral Co.
The Hommel, O., Co., Inc.

Arches (Interlocking, Suspending, and Circular)
Frazier-Simplex, Inc.

Arsenic
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Automatic Brick Car Loaders
Lancaster Iron Works, Inc.

Ball Mills
The Hommel, O., Co., Inc.
McDanel Refractory Porcelain Co.
The Vitro Mfg. Co.

Ball Mills (Laboratory Type)
Drakenfeld, B. F., & Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Barium Carbonate
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Basic Oxides
Porcelain Enamel and Mfg. Co.

Batch Systems
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
National Engineering Co.

Batts
Carborundum Co. (*"Carbofrax Aloxite"*)
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)

Bentonite
Hammill & Gillespie, Inc.

Beryl
Foote Mineral Co.

Bichromate of Soda
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Bitstone
Potters Supply Co.

Blades: (Diamond impregnated for cutting glass, tile, quartz, ceramics, Vitreous Products)
Felker Mfg. Co.

Blocks (Refractory)
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
The Vitro Mfg. Co.

Body Stains
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.

Bone Ash
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Borax
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Borax Glass
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co. Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Boric Acid (Anhydrous)
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Boron Carbide
Norton Co.

Brick Machines (also Barrows, Molds)
Lancaster Iron Works, Inc.

Brick (Refractory)
Carborundum Co. (*"Carbofrax Aloxite"*)
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
The Vitro Mfg. Co.

Cadmium Sulphide
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Carbofrax (Refractory Products)
Carborundum Co.

Carbonates (Barium, Lead)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Castings
Lancaster Iron Works, Inc.

Caustic Potash
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Solvay Sales Corp.

Caustic Soda
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Cements
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Pennsylvania Salt Mfg. Co.

Ceramic Chemicals
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Cerium Oxide
Drakenfeld, B. F., & Co.
Foote Mineral Co.

Chromite (Natural Chromate of Iron)
Foote Mineral Co.

Chromium Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Clay (Ball)
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.
The Vitro Mfg. Co.

Clay (Bentonite)
Foote Mineral Co.
Great Lakes Foundry Sand Co.

Clay (Block)
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

Clay (China)
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
The Vitro Mfg. Co.

Clay—Cleaners, Feeders
Lancaster Iron Works, Inc.

Clay (Electrical Porcelain)
Hammill & Gillespie, Inc.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Enamel)
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
Spinks, H. C., Clay Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Clay (Fire)
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Maxson, Elwyn L.
Potters Supply Co.

Clay (German Vallendar)
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Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Clay (Micronized)
Porcelain Enamel and Mfg. Co.

Clay Miners
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Potters)
Hammill & Gillespie, Inc.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Process Equipment)
Lancaster Iron Works, Inc.
National Engineering Co.

Clay (Sagger)
Georgia Kaolin Co.
Great Lakes Foundry Sand Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.

Clay-Slip (Albany)
Hammill & Gillespie, Inc.

Clay (Wad)
Kentucky Clay Mining Co.
Potters Supply Co.
Spinks, H. C., Clay Co.

Clay (Wall Tile)
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Cleaners
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.

Cleaners, Chemical
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.

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Harshaw Chemical Co.
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.

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Corhart Refractories Co.

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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.

Crucibles (Filter, Melting, Ignition)
Carborundum Co.
Norton Co.
Potters Supply Co.

Crushers (Clay)
Lancaster Iron Works, Inc.

Cryolite (see Kryolith)
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Cutters (Bar)
Industrial Ceramic Products, Inc.

Cutters: Diamond impregnated wheel type
Felker Mfg. Co.

Decorating Supplies
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Disintegrators
Lancaster Iron Works, Inc.
National Engineering Co.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Dryers (Waste Heat, Continuous and Batch Type)
Harrop Ceramic Service Co.

Drying Machinery
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
Proctor & Schwartz, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enamelers' Borax
Porcelain Enamel and Mfg. Co.

Enameling Equipment (Complete)
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The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

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Carborundum Co.
The Hommel, O., Co., Inc.
Lancaster Iron Works, Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.

Enameling Muffles
Carborundum Co. (*Carbofrax*)
Frazier-Simplex, Inc.
Norton Co. (*Alundum*)

Enameling (Practical Service)
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Enamels
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamel Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

Enamels (Porcelain)
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Engineering Service
Harrop Ceramic Service Co.

Equipment (Porcelain Enameling)
The Hommel, O., Co., Inc.

Feldspar
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Filter Fabrics
Metakloth Company

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.

Flint
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Great Lakes Foundry Sand Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Porcelain Enamel and Mfg. Co.

Flint Pebbles
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Floors (Non-Slip)
Norton Co.

Fluorspar
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

French Flint
Maxson, Elwyn L.

Frit
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
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Harshaw Chemical Co.
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Maxson, Elwyn L.
Porcelain Enamel and Mfg. Co.
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Glazes and Enamels
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
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Glaze Spar
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Norton Co. (*Crystolon*)

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Norton Co.

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The Hommel, O., Co., Inc

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American Rolling Mill Co.

Iron Oxide
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Kaolin
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
The Vitro Mfg. Co.

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Lithium Minerals
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.

Magnesite
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Magnesite Calcined
Foote Mineral Co.
The Hommel, O., Co., Inc.

Magnesium Carbonate
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Manganese
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Manganese Dioxide
Drakenfeld, B. F., & Co.
Foote Mineral Co.

Manganese (Oxide)
Corhart Refractories Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

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Micronized Products
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Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Mixers
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National Engineering Co.

Mixers (Batch)
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National Engineering Co.

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Norton Co.

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Clearfield Machine Co.
Lancaster Iron Works, Inc.
National Engineering Co.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.

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Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Nepheline Syenite
Great Lakes Foundry Sand Co.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Nitre
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The Hommel, O., Co., Inc.

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Overglaze Colors
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.

Oxides
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Palladium Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.

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Clearfield Machine Co.

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Industrial Ceramic Products, Inc.
Potters Supply Co.

Placing Sand
Great Lakes Foundry Sand Co.

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Ferro Enamel Corp.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Porcelain Enamels
Ferro Enamel Corp.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Potash (Carbonate)
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Solvay Sales Corp.
The Vitro Mfg. Co.

Producer Glass Plants
Frazier-Simplex, Inc.

Pug Mills
Lancaster Iron Works, Inc.

Pyrites (Natural Iron Sulphide)
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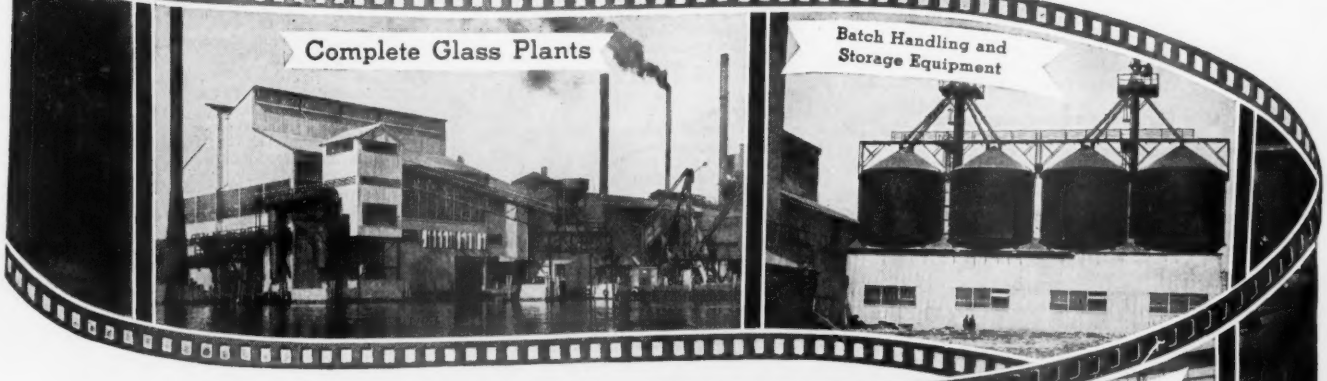

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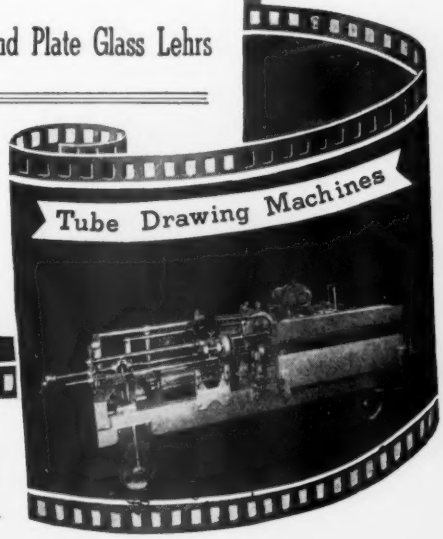

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McDanel Refractory Porcelain Co.
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Norton Co.

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Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.

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Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Titanium Alloy & Mfg. Co.

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Harshaw Chemical Co.
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Metal & Thermit Corp.
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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Sodium Nitrite
Harshaw Chemical Co.
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Tank Blocks
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Tile (Muffle)
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Electro Refractories & Alloys Corp.
Norton Co.

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Electro Refractories & Alloys Corp.
Norton Co.

Tin Oxide
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Titanium
Drakenfeld, B. F. & Co.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
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Leeds & Northrup Co.
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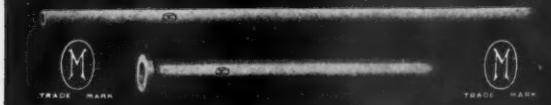

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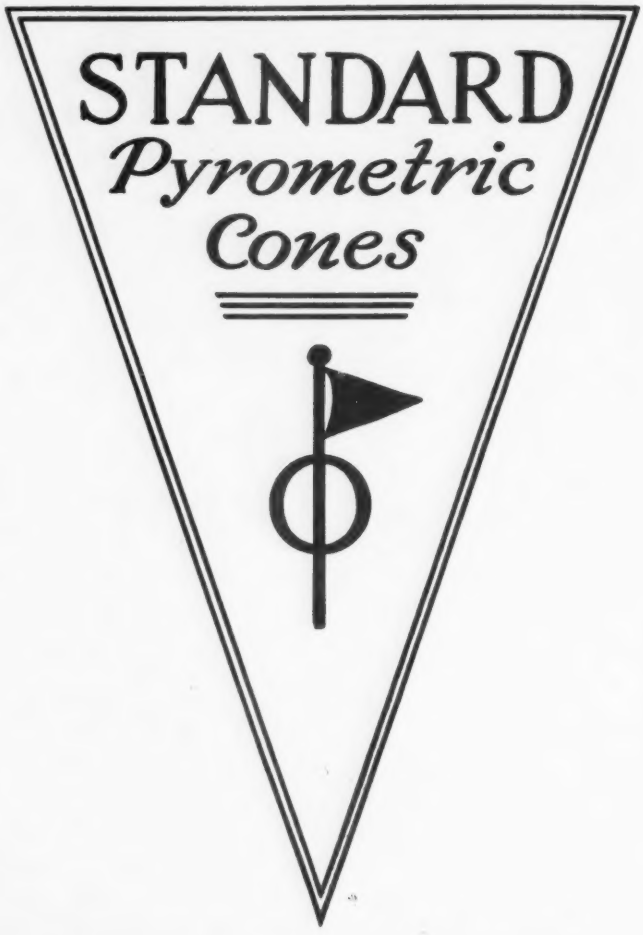

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